

THE DOCK & HARBOUR AUTHORITY

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Editorial Comments.

THE PORT OF DAR-ES-SALAAM.

We have taken for the subject of this month's Supplement the Port of Dar-es-Salaam, which is situated in Tanganyika Territory, East Africa. This port, in 1871, was known under the name of Bandari Salaam, meaning "Haven of Peace," and is deservedly given, owing to its natural beauty.

In 1884 The German East African Company was founded at this port and by treaty with the Sultan of Zanzibar obtained a trading concession.

The anchorage at the port at present comprises an outer anchorage and an inner anchorage, the former being a roadstead which is connected with the latter by a navigable channel two miles long and which has a minimum width of 450-ft., and the minimum depth of 20-ft. In the inner anchorage there is accommodation for six deep-water ships and a coasting steamer, though during the Great War 11 large and 4 small ships were berthed at this harbour at the same time.

The increase with regard to the number of ships which have entered the port during the last eight years is very considerable as in 1920 there was a total of 125 deep-water and coasting ships, while in 1927 the total was 433, an increase of 278, and likewise the amount of cargo landed and shipped from the port has also shown considerable advancement, as in 1922 there was a total of 38,458 tons inwards and outwards, whilst 1927 shows the remarkable figure of 177,291 tons inwards and outwards.

The wharf equipment comprises seven electric portal cranes and six travelling steam cranes which vary in capacity from three tons to twenty tons.

The port even now is not by any means at a standstill as a vast programme of future construction has already been mapped out. A new wharf, 650-ft. long, is one of the propositions and it is considered this will take two years to construct and the work will be carried out in sections, which will be brought into commission as they are completed.

We very much regret that the article, which appears in detail on another page, is unillustrated, but the future improvements were not sufficiently complete to warrant photographs being taken, but these we hope to supply in a future number.

GREAT WESTERN PORTS.

On Friday, 23rd November, the Great Western Railway Company gave a private show to the Press of a film of the Great Western ports, and this was described in detail in our issue for November, 1928, on page 10, under the heading "G.W.R. Lecture and Debating Society."

The film is a very complete record of all the ports of the Great Western Railway, and takes nearly an hour to run.

The Railways Act of 1921 involved far-reaching changes in the working and administration of the railways and docks.

Probably no other district has been so widely affected as South Wales. It is common knowledge that before the amalgamation the docks and railways of South Wales were in numerous and different hands. Each important dock (except Swansea) belonged to a separate Company with short railways leading to the coalfields. Swansea Docks belonged to a Harbour Trust.

The Great Western Railway for many years held the predominant railway interest in South Wales. Ten or twelve important, though relatively small, dock and railway undertakings now form part of the Great Western system.

Before the passing of the Railways Act, the dock and railway interests were in fierce competition of a local character for the coal, pitwood, iron and steel arising in or destined for the South Wales district.

Under the Railways Act the Great Western Railway have been entrusted with practically the whole of the railways and docks of South Wales.

During the past six years great improvements have been completed, others are in hand, whilst the Company's pro-

gramme includes further projects for raising the docks to a high state of efficiency.

Coaling appliances are being reconstructed or adapted throughout for wagons of 20-ton capacity, and vast extensions of the siding accommodation at the docks have already been made.

The Great Western Company, by the Railways Act, have—*ipso facto*—become trustees for the South Wales seaboard, not merely for the benefit of the industries of South Wales, but for all industrial areas within economic reach, so far as overseas trade is concerned, of the Bristol Channel.

The development of the export trade of the country is of paramount importance in restoring commercial prosperity at home.

Though the South Wales seaboard is largely identified with coal, it is a mistake not to appreciate the very considerable general trade already dealt with and the long list of regular sailings of general cargo vessels to and from all parts of the world.

In the last normal year, 1913, the trade at the South Wales Ports amounted to 50,000,000 tons, of which 42,000,000 tons represented coal and its incidental trades, patent fuel, pitwood and mining timber. The iron and steel trades account for another 3,000,000 tons, whilst foodstuffs and general merchandise and miscellaneous traffics account for the other 5,000,000 tons.

The film commences at Paddington from whence Cardiff, Newport, Swansea, Barry, Port Talbot, Penarth, Fishguard, Weymouth and Plymouth are visited.

Illustrations of some of these ports are given on various pages in this issue.

NEW GRAIN ELEVATOR AT VANCOUVER.

According to the November issue of *Industrial Canada*, the first grain elevator to be constructed on the North Shore of Vancouver Harbour was completed early in October and will be operated by the Midland and Pacific Grain Corporation, Ltd.

Located on the area recently reclaimed by the Vancouver Harbour Commissioners on the north shore, the elevator is served by the Terminal Railway of the Harbour Commissioners, which is connected with the trans-Continental lines by the Second Narrows Bridge.

The new elevator has a capacity of 500,000 bushels and trackage for 96 cars is provided. There is a pier 500-ft. in length providing berthing space for one deep-sea vessel, the depth at low water being 35-ft. The conveyor gallery has two belts with a capacity of 15,000 bushels per hour each. There are seven unloading spouts.

THE PUBLICLY-OWNED PORT AS A FACTOR IN THE DEVELOPMENT OF TRADE.

Public ownership of port terminal facilities was strongly advocated in a paper presented recently before the American Association of Port Authorities annual Convention by Shelby Wiggins, Director of the Port of Beaumont. "While there has been some disapproval expressed of the public administration of a number of proprietary or business functions," he said, "it seems to have met with the general approval of the people, who have frequently and generously voted bonds to provide the necessary funds for port and harbour development."

Mr. Wiggins set forth that by study of foreign markets to which public ports can send their emissaries, by assistance to export and import trade in supplying technical information, and by solicitation of trade, the public port commissions develop commerce and improve it. "Entire states," he said, "are behind port commissions, and an outstanding example of this is the splendid Port of Mobile, Alabama, built by citizens of that great State." The publicly-owned grain elevators, cotton warehouses, and cold storage terminals, he pointed out especially as physical contributions for the development of trade.

Tyne Improvement Commissioners' Repairing Yard, Howdon.

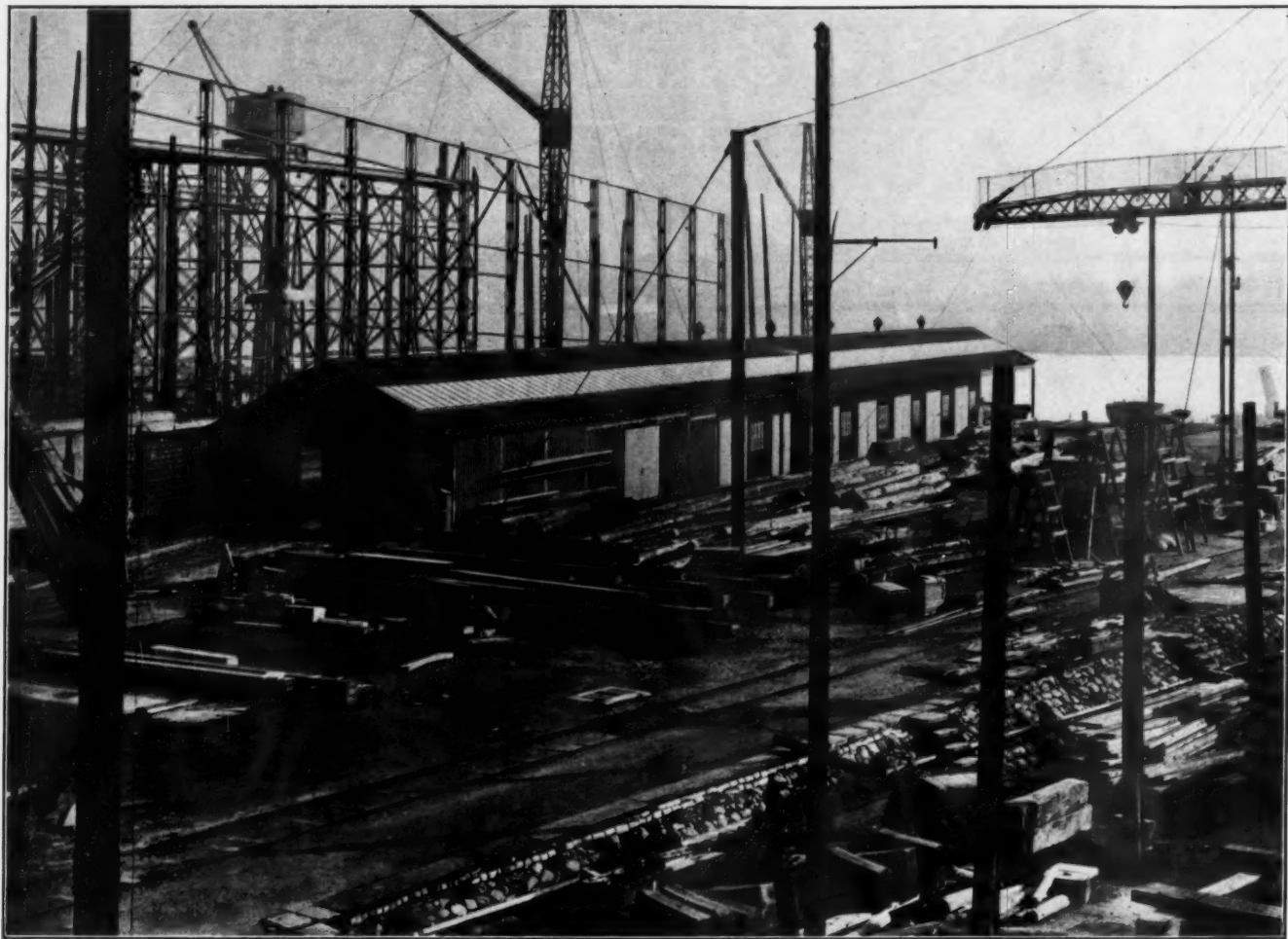


Fig. No. 1.

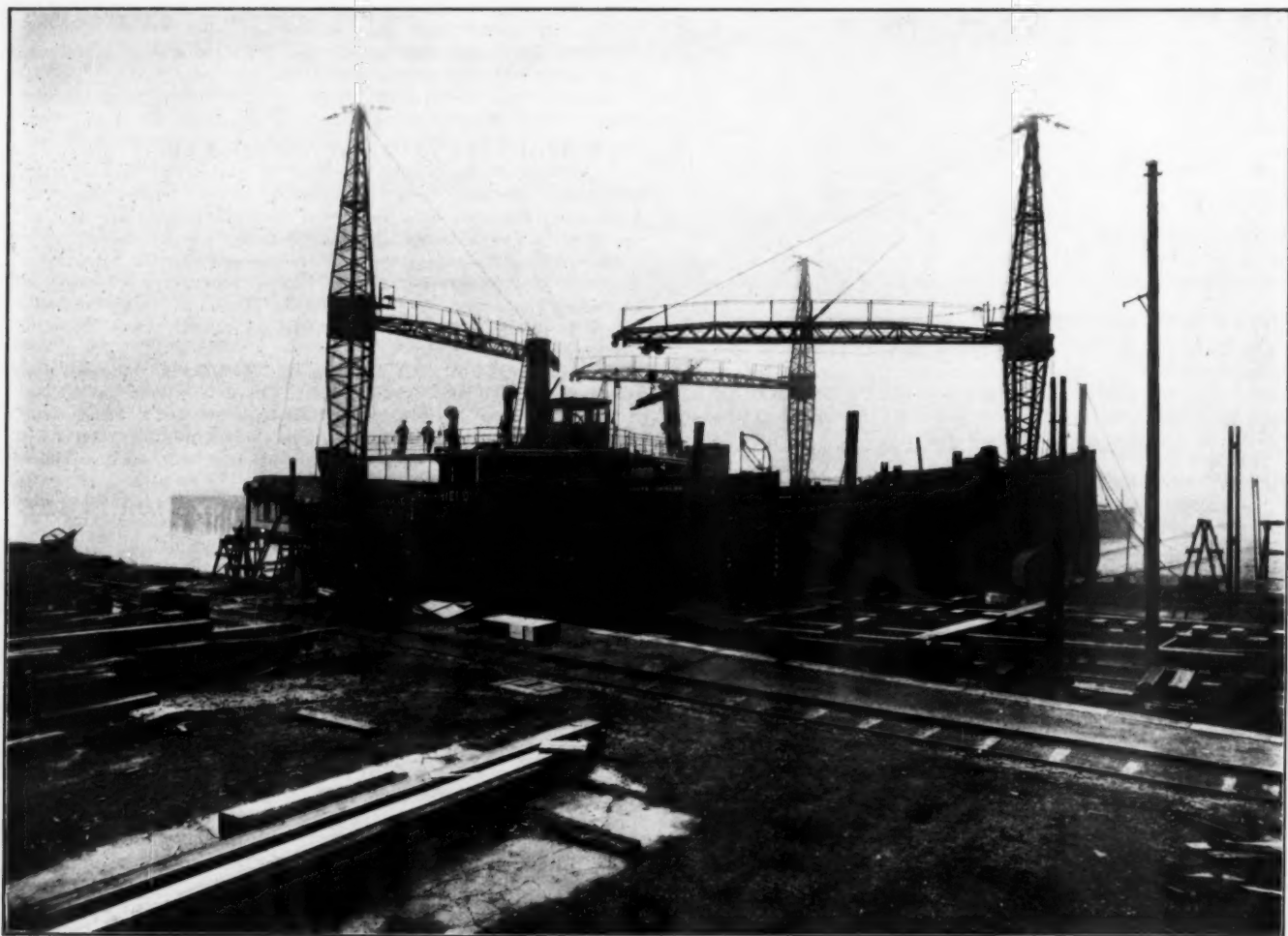


Fig. No. 2.

Modernisation of the Tyne Improvement Commissioners' Repairing Yard, Howdon.

SHORTLY after the passing of the Tyne Improvement Act, 1850, under which the Tyne Improvement Commissioners became the Conservators of the port in succession to the Corporation of Newcastle, the Commissioners obtained an area of land at Howdon and laid out a yard for the repair and maintenance of their fleet of floating plant and for the manufacture and repair of mooring buoys, chains, etc., required for the accommodation of shipping in the port.

The yard has since worked continuously and has proved to be a useful part of the Commissioners' facilities for the making and maintenance of the port.

Following the termination of the War the Commissioners decided upon a comprehensive scheme of replacement of their dredging plant by the acquisition of larger and more powerful dredgers and of steam hoppers of larger carrying capacity. This decision necessitated re-arrangement and modernisation of the yard in order to meet the demands of the larger type of dredging plant and to provide for more efficient and economic working. The following description of what has been done in that direction will no doubt be of interest to our readers.

The plan on page 35 shows the yard as re-arranged and for the purpose of this article it is divided into two—the East Yard and the West Yard. A general view of the yard as well as photographs of different sections are shown.

EAST YARD.

In the scheme two main principles have been followed:—

- (a) The concentration of allied trades in distinct areas, and
- (b) the minimum handling of material.

Fig. No. 1 shows the wood yard as altered. A range of carpenters' shops, etc., existed in about the centre of this space, but were taken down and a new shop built against the east boundary wall. This shop is of steel framing with asbestos protected metal roof, and contains accommodation for wood storage, boat repairing, fender making, etc., and is equipped with an electrically-operated slipway for hauling up small boats at all states of the tide.

For dealing with the large hoppers and other craft there are two slipways, hydraulically operated, and for one of these a new American rock elm cradle has been constructed large enough to slip the Commissioners' new 800-ton hoppers (Fig. No. 2). These slipways are served by three revolving 2½-ton electric derricks.

In addition there is a small slipway at the side fitted with a compressed air hauling winch for dealing with launches and other small craft.

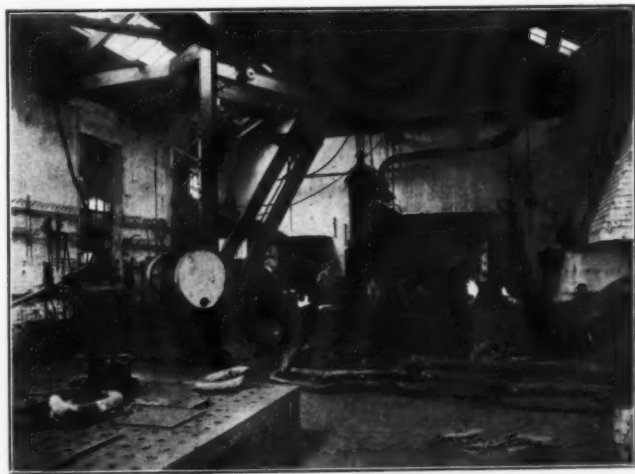


Fig. No. 5.

FITTING-OUT BASIN.

The fitting-out basin (Fig. No. 3) has been dredged and a new fitting-out jetty constructed at the west side, where, after being unslipped, craft lie for completion directly opposite the main range of shops, thus ensuring the minimum amount of transport for men and material.

A small mooring jetty has also been constructed at the north side of this basin, and the jetty on the east side strengthened and partly reconstructed; the result of which is that as many as six craft may lie in this bay in a sheltered and central position, instead of in the river where they were away from observation and exposed to tides and traffic.

On the river front a new jetty has been constructed carrying a new 20-ton hydraulic crane used for unloading and loading moorings, material and buoys, and other material and gear required in connection with the dredging and other craft (Fig. No. 4).

WEST YARD.

In the West Yard a new erecting shop and store have been constructed to take the place of an old shop and store which before demolition stood in the centre of the yard against the north wall. The new shop is lofty and fitted with a 10-ton overhead electric travelling crane for dealing with dredger tumblers and other heavy gear.

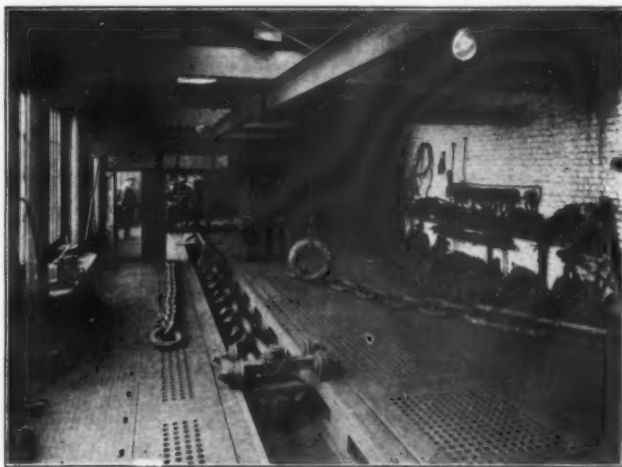


Fig. No. 6.

The main range of shops—joiner shop, machine shop, blacksmiths' shop and ironworkers' shop—have all been re-organised and fitted with modern machinery, including boring machine, milling machine and lathes. A new electrically-driven pump with accumulator for generating hydraulic power, plate rolls, bar-bending machine, a new steam hammer, and an electric welding plant have been installed. A complete installation of pneumatic plant capable of serving any part of the yard, or any craft afloat alongside is included in the modernised equipment.

A new heating and annealing furnace has been constructed fitted with patent oil burners. This furnace is double-ended, one end being used for plates and angles, and the other end, which opens out into the blacksmiths' area, for annealing the large mooring chains and other gear for the various departments of the Commissioners. The chains are wheeled into and from the furnace on bogies.

A waste heat boiler which utilises the waste gases from the furnaces has been installed in the forge; this boiler provides steam for steam hammers and heating offices and shops.

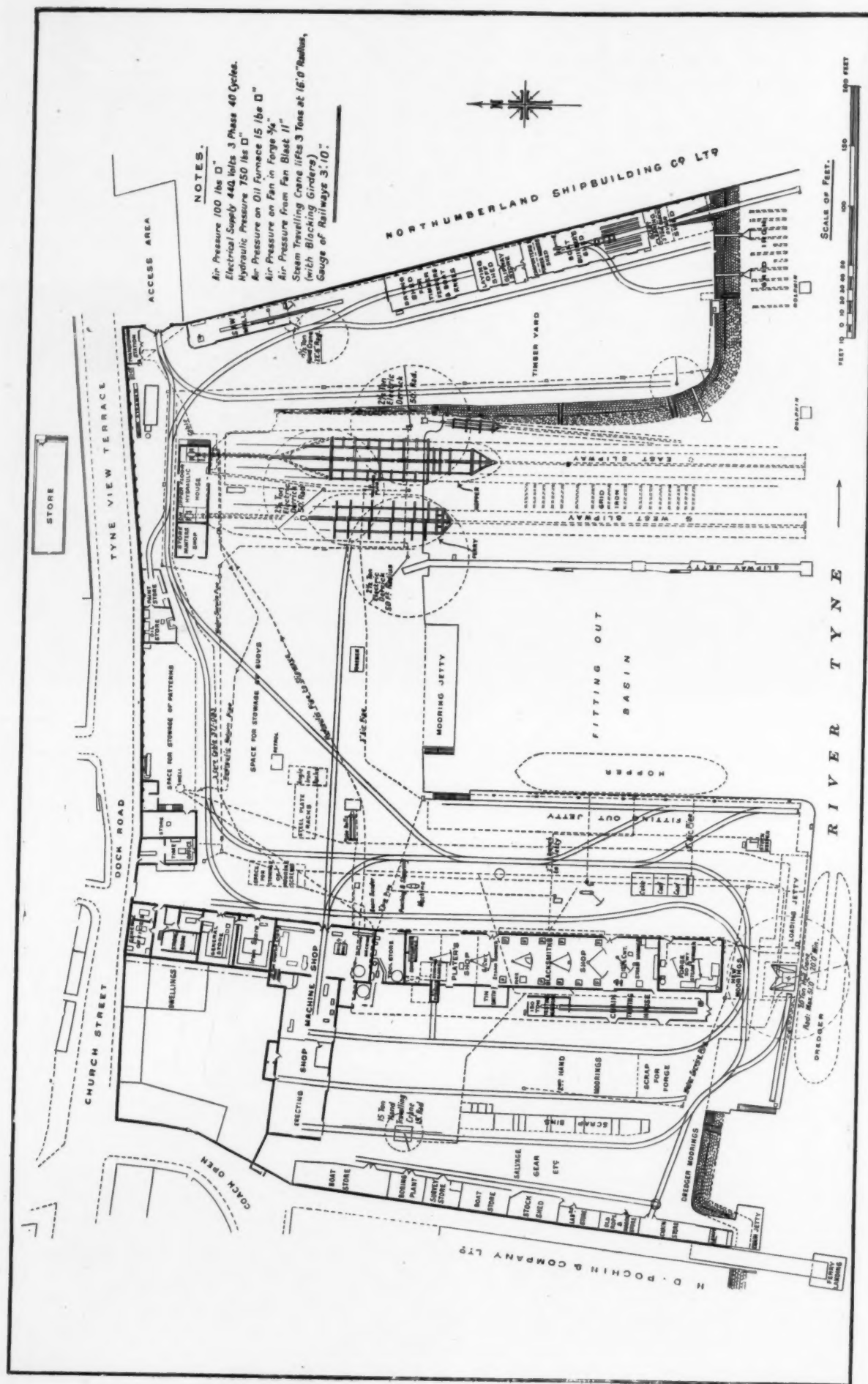
RIVER MOORINGS.

One of the most interesting features of the work carried out at the yard is the construction and maintenance of the Commissioners' moorings of which there are nearly 500 in the River Tyne. The buoys are made in their entirety, as are also the mooring screws and chains, with the exception of stud link chain. These moorings consist of bridles secured by screws screwed into the bed of the river, the bridles meeting in a big ring to which is shackled the buoy chain. The bridle links are 3-ft. long and 4-in. diameter, and are forged from scrap moorings, and the whole of the work—from the discharge of the old moorings at the wharf, its transport to the forge where it is forged into bars, then to the blacksmiths' shop where the links are scarfed, bent and welded (Fig. No. 5), through to the test house where they are tested on the Commissioners' 150-ton chain testing machine, and out of the test house to the jetty for loading up—takes place within an area about 30 yards square (Fig. No. 6).

GENERAL.

The offices, stores and other small shops also have been re-arranged and partly reconstructed, and canteen accommodation provided.

The whole of the work, which was carried out under the direction of the Commissioners' Engineer, Mr. R. F. Hindmarsh, M.Inst.C.E., extended over a period of five years—from 1922 to 1927.



Tyne Improvement Commission: Plan of Howdon Yard.
After re-arrangement, 1927.

Tyne Improvement Commissioners' Repairing Yard, Howdon.



Fig. No. 3.

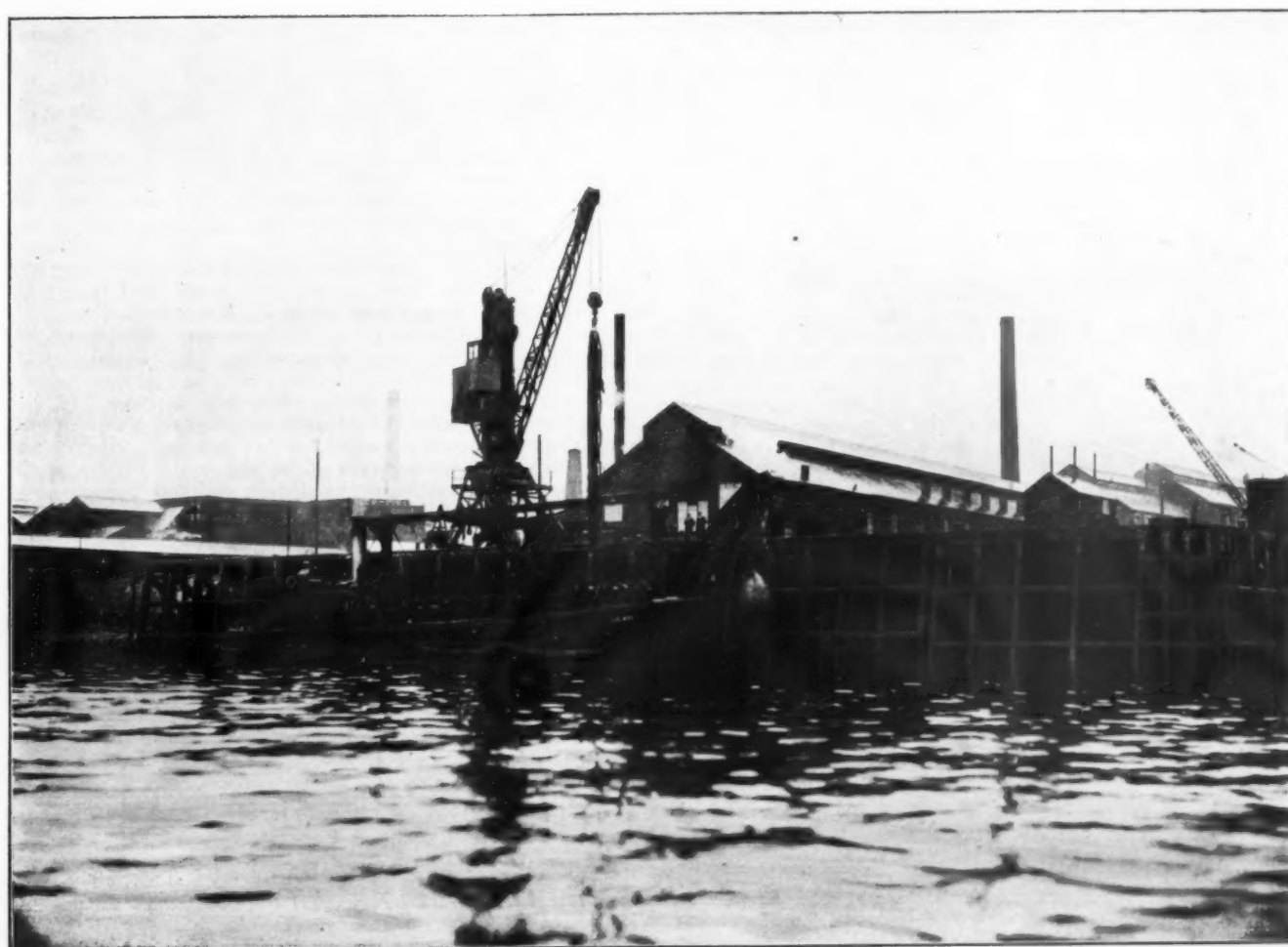


Fig. No. 4

North-East Coast Notes.

The Tyne Improvement Commissioners are maintaining their tradition by anticipating the requirements of the Tyne, more especially with the long-hoped-for revival of trade showing signs of realisation. In view of the continued increase in the size of ships they have been examining accommodation to see where improvements can be effected, and as a result a valuable addition has been made to the river's shipping facilities.

The Commissioners have in the river at Whitehill Point, five modern coal shipping staiths, three of them deep-water berths, one with a depth of 30-ft. at low water ordinary spring tide, and, until recently two with 27-ft. The depth of the two latter berths has just been increased by 3-ft., so that there are now three berths with a depth of 30-ft. low water ordinary spring tide, and 45-ft. at high water ordinary spring tide, and no limit to the available length. The necessary dredging meant the laying-off in turn of a week or two each of the 27-ft. berths, but the deepening has been satisfactorily completed and the berths with their increased depth of water are in use. The increased depth will prove to be of great advantage for deep-drafted ships will not have to wait for water or to haul off for lack of depth. This will mean quicker turns, quicker loading and quicker despatch.

The height of the shipment point at these staiths—75-ft. above low water ordinary spring tides—is exceptional. This height is attained by means of hoists which were installed some years ago and have made it easy to load and bunker big light ships when in other circumstances it would be impossible to do so. Further developments at existing berths are in contemplation.

In view of these developments it was most encouraging that at the November meeting of the Tyne Improvement Commission most satisfactory reports put members into an optimistic temper. Mr. H. P. Everett said there were signs in several directions that trade was improving, and Sir George Lunn remarked that there was a substantial increase in the coal and coke shipments from the river. The representative of one colliery said that he was refusing orders at the moment for Northumberland steam coals. Sir George Lunn added we were at the turning of the tide; he was sure the worst of the industrial depression was passed. Sir William Noble pointed out that the coal shipments were 130,000 tons up on last year.

The reports which gave rise to this spirit of optimism showed that the coal and coke shipped during October totalled 1,432,988 tons, an increase of 185,794 tons on the corresponding month of 1927, equal to 14.90 per cent., and the shipments for the ten months of this year at 13,245,534 tons exceeded those of the same period of 1927 by 128,787 tons. As to shipbuilding, the number of vessels launched so far this year numbered 64, of 273,302 estimated gross tons, an increase of 16 vessels of 61,891 tons compared with the same period of 1927.

The Pelaw Main Collieries, Ltd., of Birtley, Durham, who are embarking on a scheme to construct a new coal loading jetty on the Tyne at Pelaw Main, have placed the contract for the construction of the jetty with Mr. W. T. Weir, Howdon-on-Tyne, and the contract for the remaining portion of the work with Messrs. F. Turnbull & Co., engineers, Newcastle.

TO FACILITATE COAL SHIPMENTS.

There has been an important change made in the policy of the London & North-Eastern Railway Co., in regard to coal shipments at Dunston. There have been frequent complaints made by coal-shippers there at the frequent congestion and consequent delay, for only six of the berths out of nine have been working, and some weeks ago it was suggested that when Dunston was congested a remedy might be found by diverting some of the tonnage to Tyne Dock and the L.N.E. Railway making the charges for coal loading to those for Dunston—which ordinarily are lower than Tyne Dock. These were considerable negotiations and in the end the Railway Co. proposed (subject to conditions to be agreed to), to divert traffic to Tyne Dock under licence, and to grant a rebate equal to half the difference between the rates chargeable to Tyne Dock and Dunston. The concession is limited to a number of collieries enumerated in the agreement, and licenses are issued at the discretion of the London and North-Eastern Railway Co.'s management. The scheme is to be tried for six months and the first diversion of tonnage was made on October 29th.

While it is not yet possible to record any marked revival in the Cleveland iron and steel trades as a result of the disturbed conditions on the Continent, signs are not lacking that the situation is gradually moving in favour of producers in this area. An encouraging feature is the continued marked contraction in imports. Statistics presented at the last meeting of the Tees Conservancy Commissioners at Middlesbrough showed that during October 13,897 tons of iron and steel were imported, or less than half the quantity received in the corresponding month of last year, and a drop of nearly 3,000 tons compared with the figures for September. For the twelve

months ended October, 222,430 tons were imported as against 382,514 tons in 1926-27 and 54,564 tons in the pre-War years 1913-14.

SHIPBUILDING OUTLOOK.

There has been a rather serious falling-off in tonnage under construction at the North-East Coast Ports. Lloyds' figures for September 30th were: Tyne yards, 31 vessels compared with 42 at the end of June; Wear, 17 vessels against 26, and Tees, 10 vessels against 16. At Hartlepool there were 5 vessels compared with 4, but there was a big decrease in the tonnage. At the beginning of November out of 30 shipyards on the Wear, 7 were without a single ship on the stocks. At the same time orders are coming to hand although slowly, and a notable contract was that placed with Messrs. Swan, Hunter and Wigham Richardson by the Viking Whaling Co. for a depot ship to cost about £275,000.

Mr. William J. Branfoot, who had been closely associated with shipping in the North of England, has died at Bath. He was a son of Mr. William Branfoot, who was a member of the firm of Tyzack and Branfoot, ship owners, of Sunderland. Death also removed Mr. Robert Trail, a well-known Tyneside engineer, who had been managing director of the engineering works of Fairfield Shipbuilding and Engineering Co., of Glasgow, for some years and who had just taken up his work with Messrs. Swan, Hunter and Wigham Richardson and Co., having been invited to join the board of that company.

Canadian Notes.

CANADA'S EXPORTS OF MILK PRODUCTS.

Canada exported milk and milk products to the value of \$18,482,518 in the first eight months of 1928. Cheese (51,743,400 lbs., valued at \$11,309,448) headed the list with the United Kingdom as the best customer. The United States took 2,124,113 gallons of cream and 2,418,246 gallons of milk, valued at \$4,368,311.

LARGE GRAIN ELEVATOR AT PORT ARTHUR, ONT., OFFICIALLY OPENED.

On October 24th last, in the presence of 40 directors and members of the Saskatchewan, Alberta and Manitoba Wheat Pools, the world's largest single unit grain elevator—Pool Terminal No. 7—was officially opened by Mr. A. J. McPhail, President of the Saskatchewan Co-operative Wheat Producers, Ltd.

The elevator has a capacity of over 7,000,000 bushels, and some idea of the dimensions of the building may be gathered from the statement that it is 1,100-ft. long, has 225 storage tanks each 125-ft. high, and 558 interspace and outerspace bins. The workhouse is 210-ft. in height. The elevator was constructed in the record time of 149 days.

WIDER MARKETS FOR MANITOBA BARLEY.

A barley research laboratory is shortly to be established at the Manitoba Agricultural College in Winnipeg, and the Provincial Government has undertaken to give the necessary financial assistance in providing facilities for search and the study of marketing problems. Manitoba produces annually nearly one-half the barley grown in Canada, and during the past two years has grown more barley than wheat.

The Manitoba Barley Research Committee, which has just been organised under the Chairmanship of Mr. C. H. Burnell, President of the Manitoba Wheat Pool, has issued an announcement stating "Now that barley is becoming so important as a cash crop to the farmers of Manitoba, it is hoped that by taking more pains in the selection of seed of approved varieties and great care in the preparation of the soil, and the threshing of the crop, that Old Country maltsters may become interested in Manitoba barley, especially in that grown in the Red River valley, which is unusually low in protein content, and therefore of more value for malting purposes."

The Committee also announced that Manitoba barley, from districts where laboratory tests show the barley to have high qualities for malting purposes, was exhibited at the Royal Agricultural Hall in London at the Brewers' Exhibition in November, and a bulk shipment of this barley is being held for sale in the Manitoba Pool Terminal Elevator No. 1 at Fort William.

CANADIAN LAKE PORT DEVELOPMENTS.

According to the "Ottawa Journal," the Dominion Department of Public Works is to invite tenders on December 1st for the construction of docks at Prescott, Ontario, at an approximate cost of \$2,000,000.

This is the first step in the construction, at a total cost of \$5,000,000, of harbour works at Prescott, which has been chosen by the Canadian Government as a new terminal of lake navigation on the St. Lawrence River, and is intended to be ready to deal with traffic arising out of the completion of the Welland Ship Canal in 1930.

Notes from the North.

RAILWAY TRAFFIC ON DOCK ESTATE.

Colonel Ainley, Assistant Traffic Manager to the Mersey Docks and Harbour Board, gave an illuminating address to members of the Liverpool Traffic Club last month on "The Haulage of Railway Traffic on the Liverpool Docks." At the outset, he explained that the Traffic Department of the Dock Board is established to maintain the free flow of traffic through the port, and, to this end, has the supervision of all traffic passing over the dock quays. The executive staff consists of the chief traffic manager, two principal assistants, and seven district traffic managers. The district traffic managers are located in offices at the docks, and each has certain specified areas under his control. The actual work of handling import cargo discharged on to the dock quays is not done by the Dock Board, but by master porters who are licensed by the Board for that purpose. These men are responsible to the Board, the ship-owners and to the consignees for the goods committed to their care. They have to receive them from the ship, weigh—if necessary, stow to mark on the quay, watch and subsequently deliver to the consignee when applied for, and to make returns daily to the traffic department of all goods landed and delivered. The charges made by the master porters for the work done by them are strictly regulated by the Board.

DUTIES OF DISTRICT TRAFFIC MANAGERS.

Each district traffic manager visits every ship's berth in his district daily, in order to ascertain whether the work on the quay is being satisfactorily carried out, and whether any difficulty is being experienced in the removal of goods from the quay sheds, and in the event of it being found that, from some cause or other, traffic is not moving freely, and the discharge of any vessel is being impeded, or the removal of other goods from the quay is, or may be, delayed, the circumstances are at once brought under the notice of the chief traffic manager, who is authorised to put into operation the ample powers which the Board have for warehousing goods from the dock quays.

The trade of the port of Liverpool is essentially a miscellaneous one. Over 40 per cent. of the import traffic is taken direct to local warehouses, and only about 16 per cent. goes away immediately by rail, of which rather more than half is carted into the railway stations. The traffic department is charged with the haulage of railway wagons between the railway stations and the docks at Liverpool, and twenty locomotives are employed. This work was commenced in 1905, when 41,983 tons were hauled. The tonnage is steadily increasing year by year, and during 1920 the volume of traffic dealt with was over 1,000,000 tons.

EXPORT CARGO

Export cargo is conveyed to the ship's side in railway wagons, by road vehicle, or by barges. At Liverpool the railway wagons are hauled by the Dock Board and are unloaded by the ship-owner. Cart traffic is delivered on to the export quay by the carter. At Birkenhead the work of delivering export cargo to ship's side, either by railway wagon or cart, is mainly done by the railway companies.

An important feature for protecting cargo from damage and for keeping the sheds and roadways clean, is the scavenging department, which employs a large staff of men and six large steam wagons for removing refuse and rubbish to the Board's destructors—there to be burnt or taken to sea. The traffic department has charge of the appliances for the shipment of coal at Liverpool and Birkenhead. In normal times about 3,000,000 tons of coal are shipped annually, of which about 2,500,000 tons are used as bunker, and the balance as cargo coal. Owing to the introduction of oil fuel, this tonnage has dropped considerably. The traffic department has also the superintendence of the Woodside and Wallasey lairages at Birkenhead, which are set apart for the Irish cattle trade. This trade, which is the most extensive of its kind in the country, has lairage accommodation for 6,000 head of cattle and 22,000 sheep, with extensive slaughterhouse and chill rooms. In the year 1913, upwards of 354,000 oxen, 440,000 sheep and 100,000 pigs were landed. As many as 13,123 animals have been landed on one day, whilst 7,928 animals have been slaughtered on one day at the lairage.

BOARD'S CO-OPERATION WITH RAILWAYS.

With the object of cheapening the transit of import and export traffic through the port, an agreement was entered into between the various railway companies running into Liverpool and the Board, and the haulage of traffic in railway wagons commenced in October, 1905. The arrangement entered into was for the purpose of enabling traders to have their goods for export hauled in railway wagons alongside the quays and for imports to be loaded into railway wagons at the quays, the haulage between the docks and the stations being undertaken by the Board at a nominal figure, thus saving the cost which would otherwise be incurred from the cartage of the traffic to or from the stations. An allowance (varying according to the class of traffic concerned) is made by the railway companies on

all traffic hauled under the arrangement, such allowance being credited to the trader, whilst with certain traffic consigned at rates which include collection or delivery, an additional allowance in the shape of a cartage rebate is made by the railway companies.

The tonnage hauled under the agreement has increased steadily from the date of its inception up to the present time, as the following comparative figures show:—

Year.	Loaded Wagons.	Tons.
1906	10,066	52,000
1928	154,374	673,997

DOCK RAILWAYS.

The total length of railway line on the dock estate (apart from the main dock lines running from south to north along the whole length of the dock system), has increased from 11 miles in 1905 to approximately 70 miles at the present time, and there are ample facilities for the storage and movement of all classes of railway stock. The present number of locomotives available for work is twenty, this number being sufficient to adequately cope with all the demands made upon the Board. Seventeen locomotives are capable of hauling loads up to 1,000 tons, whilst three locomotives of a larger type are capable of hauling much heavier trains.

There are eleven railway companies stations in Liverpool, to and from which wagons are hauled by the Board's locomotives, and scheduled trip times are laid down for the working of the locomotives in order to minimise delays at the stations. A supply of wagons and vans is held by the Board on the dock estate for the purpose of meeting urgent demands from the traders at short notice, which are supplied on demand being made to the Board's railway staff. The railway inspectors are located in offices at the docks, and each have specified areas under their control. A large quantity of imported meat is loaded into meat cars on the dock estate, and such loads are hauled into the various stations to meet early connections forward from Liverpool; on busy days, upwards of 200 cars are loaded with Argentine meat at one berth, all of which is worked into the stations in time to catch early connections.

300 WAGONS PER DAY.

The railway system at the new Gladstone Dock was opened on the day following the opening ceremony on the 19th July, 1927, when loaded wagons containing import and export traffic were dealt with. The railway traffic at this dock is developing rapidly, and upwards of 300 loaded wagons were dealt with during the week ending the 20th August.

In regard to export traffic dealt with under the agreement, the discharging of wagons is carried out by the steamship company, the present rate for such services being 1s. 9d. per ton. All classes of traffic are dealt with under the haulage scheme, and the arrangements are such that no difficulty is experienced in disposing of wagons containing import traffic in time to obtain the early connections forward from Liverpool, or in placing wagons containing export traffic at the disposal of the steamship companies promptly.

The present facilities for dealing with railway traffic on the dock estate are such as would enable the Board to deal with a considerable increase in tonnage without loss of efficiency.

NEW DOCK WORKS.

Liverpool dock development to cost £88,000 has been approved by the Mersey Docks and Harbour Board. At a recent meeting, the Board considered the recommendations of the Works Committee to modernise the Prince's Dock to accommodate the larger steamers being built for the Belfast Steamship Co. Some months ago the steamers of the Belfast Co. were removed from the Prince's Dock to the Huskisson Dock, to see whether that berth would be as satisfactory as the one vacated. The experiment proved a failure, and the scheme put forward by the Dock Board Engineer is to accommodate the Belfast steamers nearer to the landing stage and the Riverside Station. The following is the minute of the Works Committee: "Letters from the Coast Lines, Ltd., intimating that the experiments of using the berth at the north side of the Huskisson branch dock No. 2 for their Belfast steamers have not been successful, and again requesting that the northern entrance to the Prince's Dock may be widened, in order to allow the new vessels, which the company are building for the Belfast trade, to use the Prince's Dock, were read, and the question of taking the opportunity whilst the Prince's Dock is run dry, of carrying out certain alterations at the west side of the dock, having been considered also, and reports on the subject, together with a memorandum of the Docks and Quays Committee having been submitted, it was resolved that the engineer be authorised to put in hand immediately the following works at the northern entrance to the Prince's Dock, and at the west side of that dock, as suggested by him, at an estimated cost of £88,645, which figure is based on the working drawings, and may, therefore, be regarded as a final estimate:—

- (1) Increase the depth of the northern entrance to the Prince's Dock to 60-ft. and lower the sill to 8-ft. below the old dock sill at an estimated cost of £58,117.

- (2) Modernise the shed at the north end of the west side of the dock at an estimated cost of £28,498.
- (3) Extend the north end of the south-west quay of the dock a distance of 20-ft. at an estimated cost of £2,000.

Coast Lines, Ltd., will pay half the cost of extending the quay referred to in No. 3.

CAERNARVON SURVEY.

Caernarvon Harbour Trust has received a letter from the British Petroleum Company asking for the inspection of plans showing what portion of the claimed land on the estate of the Trust would be available for letting. Up to the present there has not been a lay-out of the land, and it was, therefore decided to make a survey indicating what facilities could be afforded for rail and sea traffic.

A WITHDRAWN OBJECTION.

Manchester Ship Canal Co. has modified its objection to the construction of the new Liverpool-Manchester road. This work has been hung up for some time owing to the Manchester Ship Canal Co. insisting on action to restrain the Ministry of Transport from confirming the order, but close on the time when the action was to come into court the Manchester Ship Canal Co. announced its intention of abandoning the action, and consequently the course was left clear for the Minister to act.

NEW HARBOUR WORKS AT DOUGLAS.

The Isle of Man Harbour Commissioners having reported that certain defects in the structure of the Victoria Pier, Douglas, through the undermining by the sea, have become apparent, and that the work of strengthening the pier should be taken in hand forthwith for the safety of the structure as a whole, the Commissioners have submitted a scheme for the strengthening and widening by 8-ft. of a length of 400-ft. on the inner berth on the south side of the Victoria Pier, at an estimated cost of £24,500 to be spread over a period of three years.

In the Legislative Assembly, Mr. W. H. Blaker (Engineer to the Harbour Board) said that five years ago it was known that the foundations of the pier were not too good, and the matter was put into the hands of Mr. Hunter, of the Admiralty Civil Engineering Department, and he approved of the scheme. He (Mr. Blaker) had recommended that an additional wall should be built outside the foundations at a distance to be agreed upon in consultation with those who are using the pier, and at the same time the foundations of the wall should be carried down to a considerable depth below the existing sea bottom with a view to further deepening if found necessary in the future. The time had arrived when further deepening was necessary. The matter was put before Mr. Savile, the Civil Engineer-in-Chief at the Admiralty, and he approved of all the plans submitted with certain modifications. Mr. Blaker proposed that greenheart timber piles should be used for some of the work, and he suggested that use should be made of steel sheet piling. He also suggests a modification of the method of reinforcing the concrete.

FLEETWOOD "CLEAN-UP."

In connection with the general shipping of the port of Fleetwood, the pronounced activity in the harbour and channel recently is indicative that the railway authorities have a scheme in being that augurs well for the future of the port. The presence of squads of conveyors at work in and around the harbour, and the renovations to the electric cranes, capstans, and other engineering equipment on the quayside, has created a general air of speculation and provide conclusive evidence that the authorities, following the transfer of the mailboat service to Heysham, do not intend to allow the harbour to become derelict. Expectations are that before very long a new line of shipping will be inaugurated. Since the mail steamers departed, the shipping connected with the chemical works at Burn Naze has increased to such an extent that quite busy scenes are witnessed on the quayside. It is conjectured, with the rapid development of the plant at Burn Naze, that in the months to come the whole of the shipping used by the Imperial Chemical Industries, Ltd., will be concentrated at Fleetwood.

REPAYMENT TO DOCK BOARD.

Wallasey Corporation Rating Committee records that £6,602 6s. 8d. rates are to be repaid to the Mersey Docks and Harbour Board. The repayment of the money is the result of an appeal by the Board, who maintained that they had been overcharged in regard to some of their property in Wallasey. The assessment covered three years, and the appeal was heard by the Assessment Committee, and granted.

LIFTING A BRIDGE SIX INCHES.

The swing bridge over the Manchester Ship Canal at Old Trafford was raised six inches last month. It was an Herculean task, which required the services of 100 men. The bridge weighs 1,800 tons. It revolves on a series of 63 rollers which have been in use for 34 years and have now been replaced. The lift was performed by four hydraulic jacks, erected on piers which were sunk in the canal by divers. Crowds of people assembled near the bridge to watch the workmen at the task by the light of acetylene lamps. The work is now approaching completion.

DOCK BOARD TOLL BRIDGE.

Another endeavour is being made to make toll-free the Poulton Bridge, which crosses the Great Float and connects the boroughs of Birkenhead and Wallasey. Representatives of the two Corporations are to meet representatives of the Dock Board (the present owners of the bridge), with a view to coming to an arrangement satisfactory to all concerned.

DOCK BOARD TRAFFIC RETURNS.

The tonnage of foreign import cargoes at Liverpool and Birkenhead during the month of September was not so heavy as the average of the preceding few months, the total being 478,528 tons. One striking fact which deserves notice is that the goods taken by motor lorry from the docks to outside districts is down to 23,130 tons, but there has been no noticeable increase in railway haulage from the docks. The total for the latter traffic was only 22,000 tons. About 45 per cent. of imports is cleared from the quayside by horse-drawn carts or motor lorry. Some idea of the months' works is provided by the following brief summary of traffic clearances:—To local warehouses, factories and mills, 236,900 tons; to local railway stations, 15,000 tons; to foreign and coastal berths, 14,800 tons; to canal depots, 390 tons; barges, 280 tons; other destinations, 2,150 tons. Another interesting point is that overside deliveries to local warehouses, mills, etc., amounted for 122,000 tons. The disposal of the cargoes was as follows:—Local factories, warehouses and mills, 364,240 tons (76.1 per cent. of total import); to railway stations, 37,000 tons (7.7 per cent.); to canals, etc., 25,100 tons (5.2 per cent.); and the remainder miscellaneous.

Swansea Docks.

New Two-storey General Cargo Transit Shed with Two New Berths.

Following upon the recent announcement of the provision of three new 3-ton hydraulic general cargo cranes at the Roath Dock, Cardiff, the Great Western Railway Company have now brought into operation a further important new facility at their Swansea Docks.

The Mole which juts into the east end of the King's Dock, Swansea, has been developed into two new general cargo berths.



The "Delagoa Maru," the first vessel to be dealt with at the New Shed.

The Mole is 680-ft. long, and 141-ft. wide, and the company have erected thereon a two-storey transit shed 352-ft. long by 75-ft. wide, equipped with two 4-ton gantry cranes on the ground floor, and eight semi-portal 3-ton electric luffing cranes on the quay, four at each side of the shed, thereby providing two new additional berths for cargo steamers.

The shed was built by Messrs. Sir William Arrol and Co. and the cranes were erected by Messrs. Stothert and Pitt, and Messrs. Holt and Willetts, Ltd.

The first vessel to be dealt with at the new shed was the "Delagoa Maru," which loaded on the 26th October.

The provision of these two additional berths will considerably enhance the already admirable facilities at Swansea Docks, which rank amongst the best equipped docks in the country.

The Great Western Company by their policy of continuously improving their existing facilities, new works and appliances, as well as giving concessions in dock dues and charges, are doing their best to induce and encourage business, and are evidently not allowing the present depression to deter them in their faith that sooner or later a revival in trade is bound to come. When it does, the ports of the Great Western Company will be in the position of being well equipped to meet the increased demands made upon them by such a revival.

The Port of Dar-es-Salaam, Tanganyika Territory, East Africa.

By W. H. BUDLER, Assoc.M.Inst.C.E., Resident Engineer, Harbour Scheme.

DAR-ES-SALAAM, Haven of Peace, may justly be described as a beauty spot, one of nature's favourites, with a perfectly romantic-looking lagoon within and a narrow entrance so wonderfully camouflaged by the apparent continuous coastline as to be invisible from the sea. The harbour does not belie its name. There is no bar, nor is there any record of a wreck from natural causes, nor do the ships in port drag their anchors, nor has there been the necessity up to the present for the port to own a tug, nor have there been dredging operations worthy of the name. It cannot boast of any antiquity as a port. The trade route sixty years ago struck a fairly direct line for Zanzibar, touching the coast about twenty miles north of Dar-es-Salaam.

In 1871 Said Madjid, Sultan and patron of slave traders, hard pressed at Zanzibar by British ships patrolling the East Coast in the interest of the Abolition of Slavery to which policy he was antagonistic sought refuge in this port, giving it the name of Bandari Salaam—Haven of Peace. The name was automatically altered to Dar-es-Salaam. Said Madjid's palace and harem were built on the site of the present post and telegraph accountancy building and his garden extended from the Secretariat to West Ferry Point. He founded the Port of Dar-es-Salaam. Dr. Karl Peters arrived in 1884. Acting on the advice of his report the German East African Company was founded, by Charter from the German Imperial Government. The company by treaty with the Sultan of Zanzibar obtained a trading concession which was displeasing to the Arabs. The concessionaires becoming involved in serious trouble, the German Government intervened. In 1890 the State took over the administration from the Chartered Company. By agreement with the British Empire the territory became a protectorate of the German Empire with Dar-es-Salaam as its capital and principal port. In 1905 the construction of the main trunk line of railway from Dar-es-Salaam to the interior was started. By 1912 it had been extended as far as Tabora. In February, 1914, it had reached Kigoma, and railway communication between the Port of Dar-es-Salaam and Lake Tanganyika was established.

The Supplement shows the situation, growth and facilities; and indicates the projects and programme for future extension.

ANCHORAGE.

The outer anchorage is the roadstead to the north of Lighthouse Island, from where ships are accompanied by the port pilot on their entrance through the navigable channel to the inner anchorage of the harbour. The channel itself is nearly two miles long, has a minimum width of 450-ft. with the minimum depth of 20-ft. at maximum low springs, and one single shoal patch. This shoal is quite soft, a deposit of liquid mud, apparently undisturbed by currents and the variations in the rise and fall, and has a minimum depth of 15-ft. 6-in. at maximum low springs. The future growth of the port may necessitate and justify some dredging in the channel. The shoal patch will be removed and two corners, one at each end, may require trimming, as shown on the above-mentioned Supplement. There is, however, no immediate intention of dredging here, because the port is at present visited by the class of ships whose length, draught and propulsion will allow of their entry and departure in perfect safety. The inner anchorage has accommodation for six deep water ships and a coasting steamer, all swinging free, each of which can be brought in and out without the assistance of a tug. It is on record that during the Russo-Japanese War of 1903-4 the ill-fated Russian Fleet on her way to Japanese waters entered and anchored in the harbour. Also during the great war eleven large and four small ships were berthed within the harbour at the same time, some of which were tied up stem and stern. The maximum number of ships, since the Great War, which anchored within Dar-es-Salaam Harbour at one and the same time is eight, the date being the 6th of April, 1926, and the details as under:—

Name of Ship.	Displacement (tons).
"Manela" (B.I. Line)	11,000
"Azania" (T.R.S. Line)	606
"Clan Ross" (Clan Line)	8,000
"Dumra" (B.I. Line)	2,300
"Aviateur Roland Garros" (French Line)	9,000
"Tanjanyika" (German Line)	8,800
"Karoa" (B.I. Line)	7,000
"Ussukuma" (German Line)	7,700

There are two shoal patches in the inner anchorage, both clearly shown in the Supplement, their minimum recorded depths at low springs being 18-ft. 3-in. and 11-ft. 9-in. respectively. They are quite soft, a mass of liquid mud. The maximum recorded range of tide at Equinoxial Springs is 14-ft. 3-in., and the minimum during neaps at the solstice is 1-ft. 9-in.

SHIPPING.

The register of the Marine Department furnishes the following figures covering the number of ships which actually entered the harbour during recent years:—

Years.	Deepwater Ships.	Coasters.	Total.
1920	71	84	155
1921	98	104	202
1922	116	195	311
1923	120	181	301
1924	142	133	275
1925	166	160	326
1926	190	183	373
1927	237	196	433

IMPORT AND EXPORT CARGO.

The principal imports are cotton piecegoods, foodstuffs, ordinary building material, steel and ironwork and machinery under which head farming implements, motor cars and motor lorries show a high percentage. The chief exports are sisal, ground nuts, palm kernels, coffee, cotton, copra, hides and skins, grain, beeswax, copper regulus or matt exported in ingots, and tin exported in bags as an amorphous powder, sometimes called tin-stone or cassiterite. The following are the totals in tons of all cargo landed at and shipped from the Port of Dar-es-Salaam during recent years:—

Year.	Inwards.	Outwards.	Total.
1921 (Apl.-Dec.)	11,383	29,347	40,730
1922	17,003	21,455	38,458
1923	31,416	24,687	56,103
1924	40,265	41,269	81,534
1925	69,319	51,659	120,978
1926	91,686	56,134	147,820
1927	105,753	71,538	177,291

PORT ACCOMMODATION.

Terminal accommodation will, at the close of this year, include a reinforced concrete openwork wharf (on piles of the same) 930-ft. long, having a minimum depth of water of 6-ft. for lighterage at all states of the tide, 50,000 square feet of permanent import shed accommodation, and 40,000 square feet of permanent export shed accommodation. The wharf is entirely new. It was begun in July, 1925, and will be in complete operation by the end of this year. Longitudinally it is on tiers of piles 10-ft. apart. Cross sections of the piles are shown in the Supplement. The piles themselves are 15-in. square, were cast to a length of from 40 to 45-ft. and driven to a set of not more than 2-in. in ten blows under a drop of 3-ft. 3-in. with a steam hammer weighing 30 cwts. There are five permanent sheds, two of which were existing and three built within the past two years. The foundations of the new single-storeyed sheds have been carried well below the level of the original sea bed, while those of the new double-storeyed shed and offices are partly on reinforced concrete piles. The cost of the reinforced concrete wharf, including rail-laying and deck finish, but exclusive of all filling and rubble banking is £82 per lineal foot of wharf. The cost of the new single-storeyed sheds works out at 13s., and of the new double-storeyed shed and offices at £1 17s. 0d. per square foot of area covered at ground level.

WHARF EQUIPMENT.

The equipment is almost entirely new, was supplied and erected during the period of construction and consists of:—

One 20-ton electric portal crane; one 5-ton electric portal crane; five 3-ton electric portal cranes; five 5-ton travelling steam cranes; one 3-ton travelling steam crane.

One 1-ton transporter, electrically driven, operating between the high level export shed and lighters at the wharf front.

One 1-ton electrically driven hoist operating between wharf level and the high level. The total cost of this plant, including erection is £28,400, at the rate of £30 per lineal foot of wharf. The electric portal cranes and the electrically driven transporter were supplied by Messrs. Sir William Arrol and Co., of Glasgow, the steam cranes by the Grafton Co., Bedford, and the electric hoist by Messrs. Herbert Morris, of Loughborough.

RAILWAY FACILITIES.

The railways are clearly shown on the above-mentioned Supplement. The busy export season begins in July. In August export sheds are filled to overflowing, copper from the Belgian Congo at the rate of 3,000 tons per month is one of the outstanding items of export. Railways in the interior have been considerably extended during recent years, and a growth in the export trade is expected, to cope with which it has been found necessary to erect temporary sheds. The bulk of the export cargo is brought by the railway, stored in the sheds and shipped by first opportunity.

PRESENT POSITION.

The works above described were begun in June, 1925, and will be finished before the end of this year within the estimated cost of £235,500 on the completion of which the initial stage of harbour improvements will have been reached and the Port of Dar-es-Salaam will conveniently handle 200,000 tons of cargo, inwards and outwards, per annum.

BERTHING ACCOMMODATION.

The displacement of deep-water ships entering the Port of Dar-es-Salaam ranges from 4,000 tons to 12,000 tons. The deep-water shipping has been plotted between the years 1920 and 1927 and the graph through their intersections extended to cover a period up to 1940 with the following results:—

From 1920 to 1927 (inclusive) the figures vary between 71 and 237. The following table shows the number of deep-water ships which may be expected to enter the Port of Dar-es-Salaam in the years specified:—

1928	1930	1932	1934	1936	1938	1940
250	305	360	415	470	525	580

To provide the extra berthing accommodation there is a proposal to have fixed moorings up the creek, six of which all in line are shown on the Supplement, it being possible by going farther up the creek to extend the number. This class of mooring will require the co-operation of a tug, a commodity the use of which the port has as yet not been in need of.

FUTURE EXTENSION.

The totals of all cargo have been plotted between the years 1921 and 1927 and the graph through their intersections extended to cover a period up to 1940 with the following results:—

From 1921 to 1927 (inclusive) the annual figures vary between 38,458 tons and 177,291 tons. The following table gives the total cargo (in tons) which may be landed at and shipped from the port in the years specified:—

1928	1930	1932	1934	1936	1938	1940
205,000	270,000	330,000	390,000	450,000	510,000	575,000

These figures may be an approximate indication of the growth of future trade at the port, from which a forecast of the extension and further improvements can be made. From the results of such indication and forecast a programme may be drawn as a guide to future operations. Any calculation based on the rate of handling cargo on the wharf per day, or per speed limit of cranes, is difficult owing to the fact that loading and unloading of lighters is so very irregular, intermittent in fact, and to a great extent spasmodic; 1,500 tons of cargo may be handled on one day and for the rest of the week the cranes may be almost idle. The more reasonable and practical method of calculation is on the basis of the total tonnage passing over the wharf front per annum, and the assumption is made from previous experience recorded at different ports that 250 tons per lineal foot of wharf frontage per annum is the figure which may be adopted. The actual length of the newly-completed wharf is 930-ft. The total length (in feet) required for each of the years specified below up to 1940, is given in the following table:—

1927	1928	1930	1932	1934	1936	1938	1940
710	820	1,080	1,320	1,560	1,800	2,030	2,300

Broadly speaking, it would appear that before the next decade has gone by, the total length of wharf frontage should be considerably more than double the length of the newly-completed wharf.

Shed accommodation will now be considered, the calculation being on lines similar to the above with the record of previous experience at various ports, on the assumption that 100 square feet of floor area may co-ordinate approximately with one lineal foot of wharf frontage. The actual total permanent shed accommodation for 1928 is 90,000 square feet. The estimated accommodation (in sq. ft.) required for the different years specified below up to 1940 will be found in the following table:

1928	1930	1932	1934	1936	1938	1940
82,000	104,000	127,000	151,000	176,000	203,000	230,000

Again it would appear from the above that in 1936 the permanent shed accommodation may have to be nearly double of the now existing accommodation in order to conveniently cope with the anticipated increase in cargo.

PROGRAMME OF FUTURE CONSTRUCTION.

This matter is now receiving the attention of the administration and also of the consulting engineers acting on behalf of the Government. The extension will be gradual, with the object, if possible, of keeping somewhat ahead of anticipated requirements. A proposed wharf will take off in an almost southerly direction from near the western extremity of the newly-constructed wharf, and will be backed by seven acres of reclamation upon which proposed new sheds will be erected. This proposed wharf will be for lighterage only and have a minimum depth of 7-ft. at L.W.O.S.T. The reclaimed area behind it will provide stacking ground. The length of the proposed new wharf will be 650-ft. It will take two years to construct. The proposed sheds and reclamation will be done simultaneously with wharf construction. The whole will be completed in sections which will gradually be brought into commission as the work advances and should satisfy requirements up to 1934.

Subsequent further extension may be kept in view, the intention being to continue the proposed wharf alignment for a distance of 500-ft. and then follow a westerly course up Gerezani Creek and back again, also doing dredging and reclamation, and erecting more sheds simultaneously, so that a total of 17 acres will ultimately be reclaimed and the provision of one or perhaps two deep-water berths and their corresponding sheds may be contemplated. With this addition to the previously considered programme it should be possible to provide suitable port and harbour accommodation to satisfy requirements up to the year 1940. The provision of corresponding railway terminals will be undertaken by Tanganyika Railways, working in conjunction, so that a perfectly co-ordinated scheme should result as indicated by broken lines bordered red on the Supplement.

THE HARBOUR SURVEY.

A comprehensive survey, including soundings, borings, and current observations, has been made of the harbour and entrance channel by a competent staff under the guidance of the consulting engineers. This work took eighteen months to complete. The channel was accurately defined, the shoals located, depth of water recorded all over the harbour and entrance, current observations measured in the entrance channel and in the localities where it is proposed to extend wharfage accommodation, and borings made on the shoal patches and wherever further construction and dredging operations may be necessary. The survey has already proved its usefulness and will be of exceeding value on the proposed extension and in the future development of the harbour and its entrance.

MANAGEMENT.

The marine superintendency, a sub-department of Tanganyika Railways, regulates and controls all traffic by water. The Port and Harbour Advisory Committee, of which the General Manager of Railways is the chairman, holds its meetings from time to time. The Comptroller of Customs and the Director of Public Works are on the committee, on which the Chamber of Commerce, Lighterage Companies and the Belgian Concession are also represented. One of the partners in the firm of Consulting Engineers, Messrs. Coode, Fitzmaurice, Wilson and Mitchell, has during the past three years made an annual visit of inspection and also taken control of the surveys. The construction is being done by administration, directly under the Department of Public Works.

Port Dues in Yugoslavia.

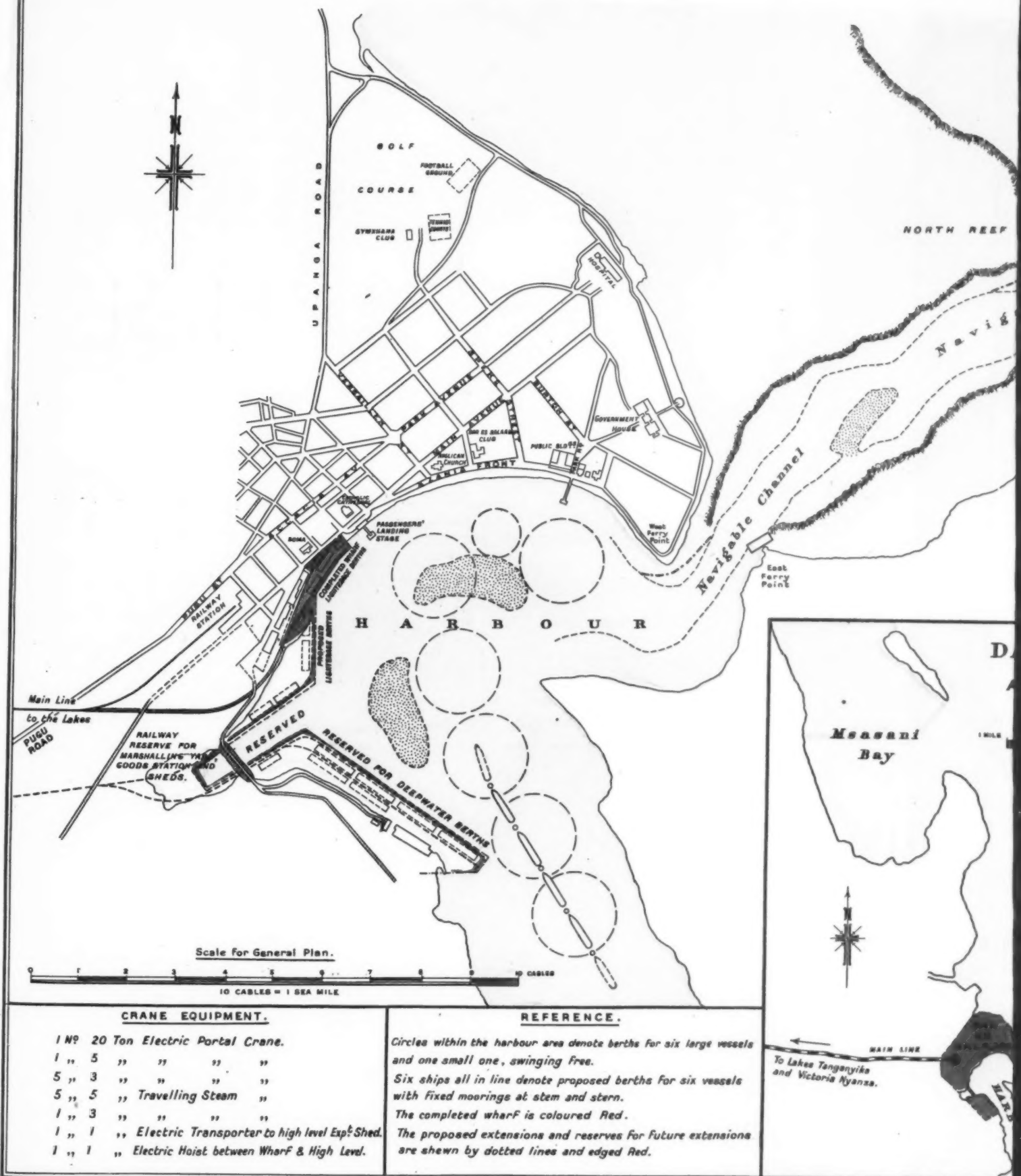
The Department of Overseas Trade has received from the Commercial Secretary at Belgrade the following list of official rates of exchange for the payment of port dues in Yugoslavia for the month of November, which appeared in the "Official Gazette" of the 27th October:—

	Dinars.
1 Gold Napoleon	219.00
1 Pound Sterling	276.00
1 American Dollar	56.90
1 Canadian Dollar	56.60
1 German Mark, gold	13.55
1 Austrian Shilling	8.00
1 Belga	7.91
100 French Francs	222.20
100 Italian Lira	298.00
100 Dutch Florins	2281.30
100 Roumanian Leis	34.40
100 Danish Crowns	1517.20
100 Swedish Crowns	1521.00
100 Norwegian Crowns	1517.20
100 Spanish Pesetas	918.75

Personal enquiries regarding shipping and transport matters should be made at the City Office of the Department (Shipping and Transport Section), 73, Basinghall Street, London, E.C.2.

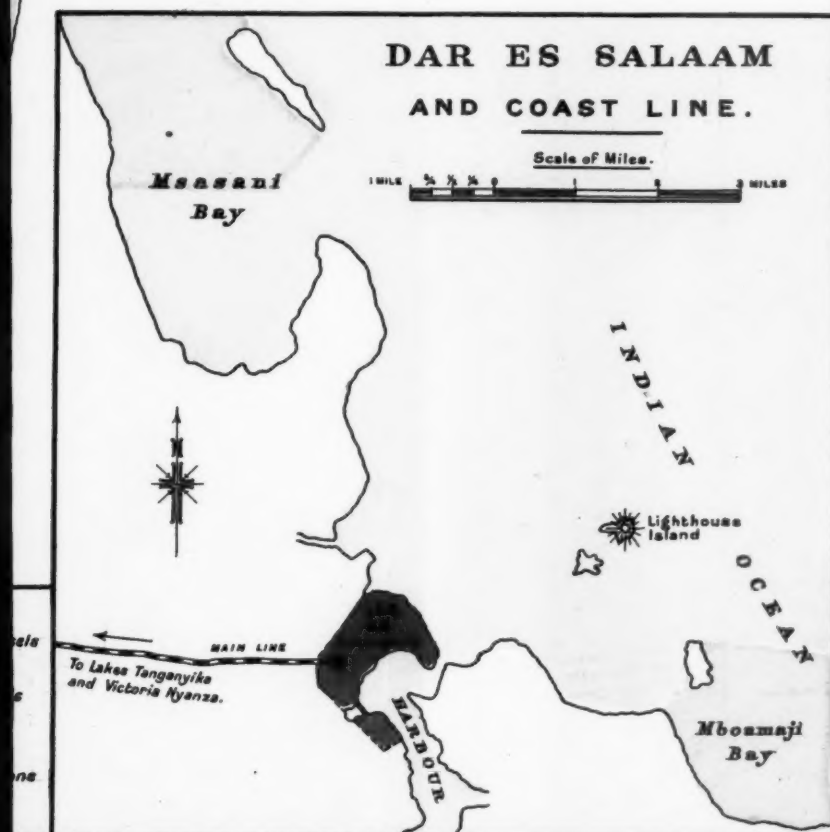
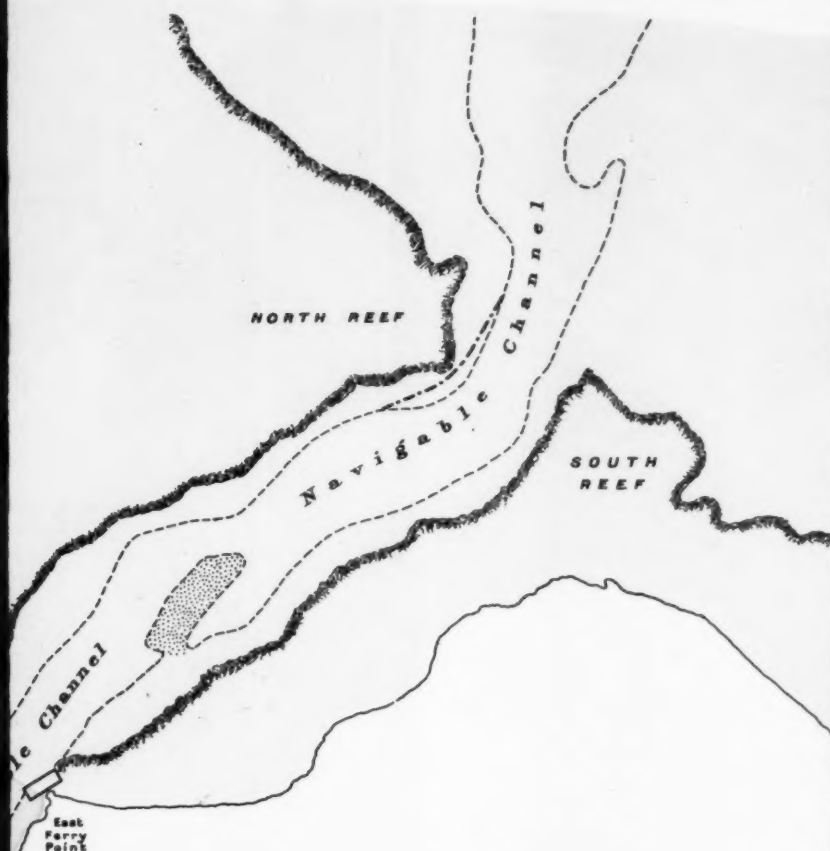
DAR ES SALAAM HARBOUR

UNDER THE JURISDICTION OF THE PORT & HARBOUR ADVISORY COMMITTEE FOR DAR ES SALAAM.

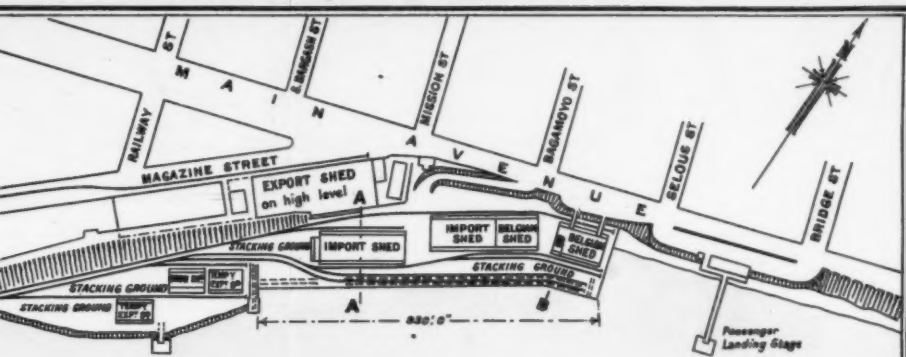


HARBOUR.

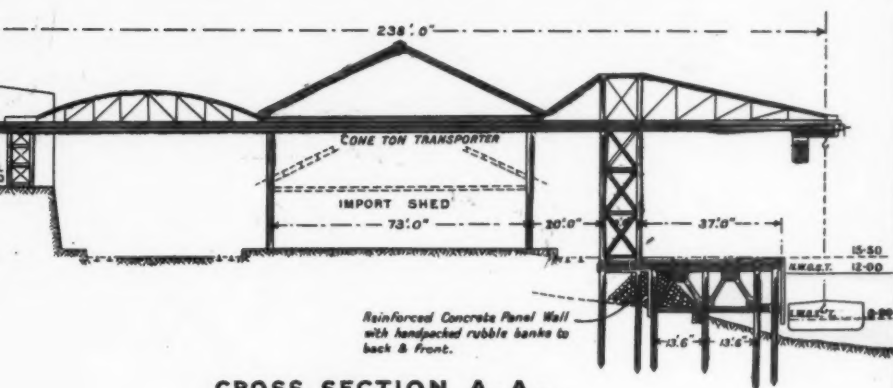
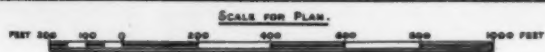
COMMITTEE FOR DAR ES SALAAM.



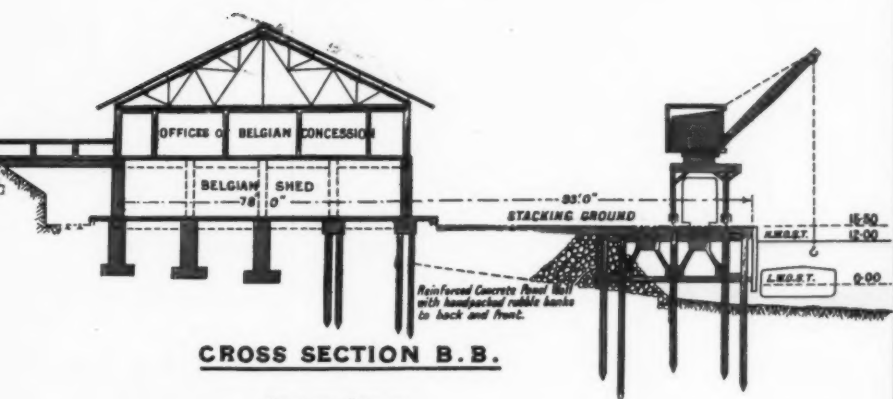
DECEMBER, 1928.



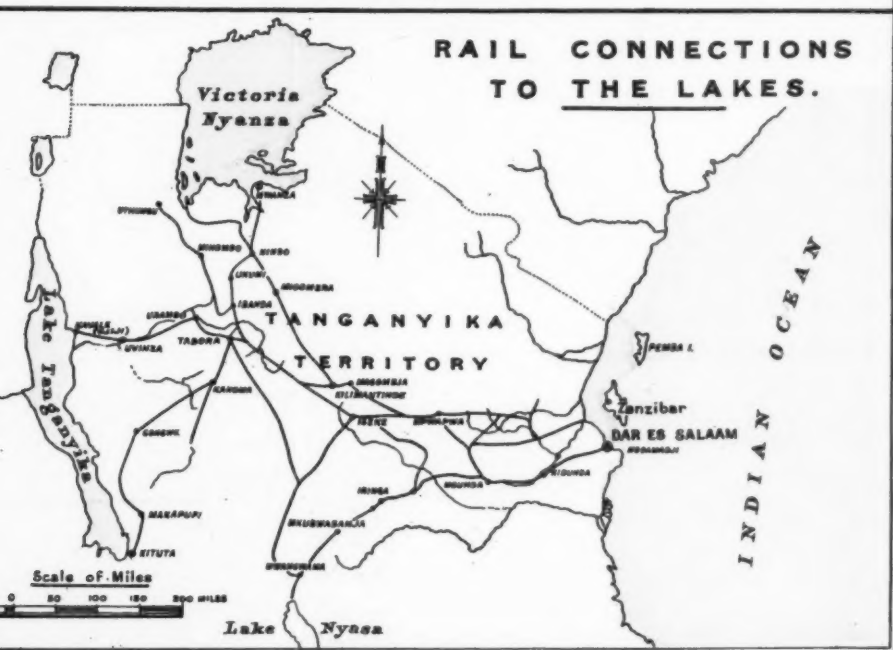
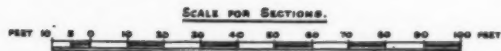
PLAN OF EXISTING WHARF.



CROSS SECTION A.A.



CROSS SECTION B.B.



STATE OF CALIFORNIA

OFFICE OF THE ATTORNEY GENERAL

IN WITNESS WHEREOF, I have hereunto set my hand and the seal of the State of California, this _____ day of _____, 19____.

Attorney General

Harbour Engineering Notes.

WELDING IN HARBOUR CONSTRUCTION.

Welding has displaced rivetting in the construction of the largest steel buildings to such an extent that some engineers confidently predict that in a few years time rivets will be completely out of date. While this may be a somewhat confident prophesy, there is no doubt that welding is making remarkable progress, and that many steel buildings are now



Fig. 1. General View looking down Pier, showing position of Central Main Girder.

being designed for welding. Generally speaking, welding design has the advantages that it permits of a lighter construction, and that the saving in the design of members is considerable. In addition, there is an appreciable saving in time and labour in the work of erection. That a welded steel framework can be erected to carry the heaviest loads is evident from the successes already achieved in welded buildings in America and Australia.

As far as this country is concerned, electric welding is being used more and more for repair and strengthening purposes, and one or two jobs of this nature have been described in these columns. An interesting one from the point of harbour engineers is that recently carried out to a marine railway pier in this country.

In this case the pier is 727 yards long and 22-ft. wide, supporting two tracks carrying steam traffic to the pier head to enable passengers to embark straight from the train on to the boats. In this case promenade and tramway piers run alongside, forming separate constructions. They are united at the pier head and in a common station and pavilion at the shore end.

The railway pier is supported by four sets of wrought iron plate girders of 40-ft. span and 3-ft. deep. The track itself is carried on concrete decking running up to and in contact with the insides of the main girder webs.

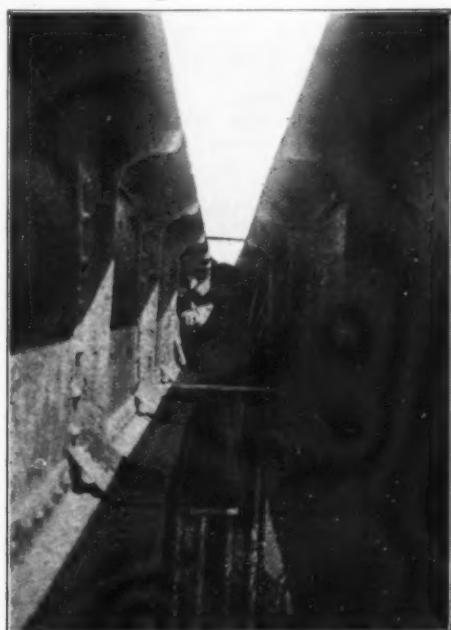


Fig. 2. View between Central Main Girders, showing operator at work.

The outside main girders and the flanges of the central main girders are in good condition, but the webs of the latter have become badly corroded owing mainly to the difficulty of getting down between them to clean them effectively.

It was therefore decided to reinforce them by welding in fresh web plates on the insides of the three end panels of each girder. The track sides of the girders could not be reinforced similarly, even if considered necessary, owing to the presence of the concrete decking.

A photograph, taken while looking down the railway pier toward the shore is shown in Fig. 1. The main girders that



Fig. 3. View looking down on Central Main Girders, showing regulator.

were strengthened can be seen in the centre of the picture and new web plates ready to be welded in are seen lying in the track between the rails. It will be noticed that there is not much room to pass down between the girders. Figs. 2 and 3 show welding in progress. The plank on which the man is standing in Fig. 2 was covered by water at high tide. One of the regulators and the screw struts for holding the plates in position prior to welding are shown in Fig. 3.

Before welding, each panel was measured up and the new plates cut to fit, with bevelled edges. This did not prove as expensive as might be thought on first consideration as most of the new plates in similar panels were required to be of the same size.

Forty-four girders in all were strengthened and 264 plates prepared, each being welded on the upper and lower horizontal sides to the flange angles, and on the vertical sides to the end angle and also the stiffeners.

All welding was carried out while the trains were passing over and no interruption to traffic whatever was caused. Six small runs were required for the horizontal welds and three for the vertical sides. This varied to some extent as the section of the vee was naturally irregular owing to the corroded edges of the angles and tees.

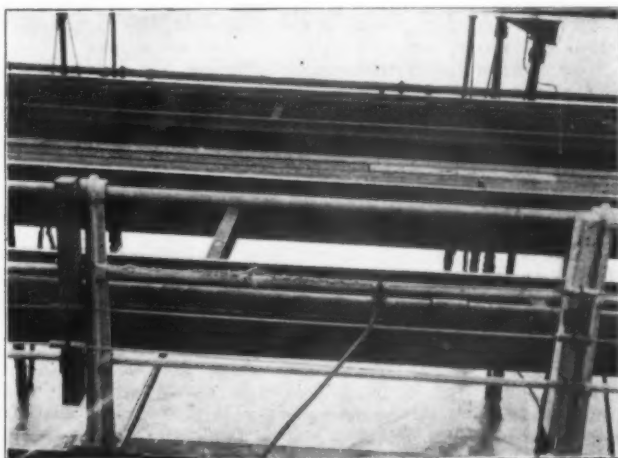


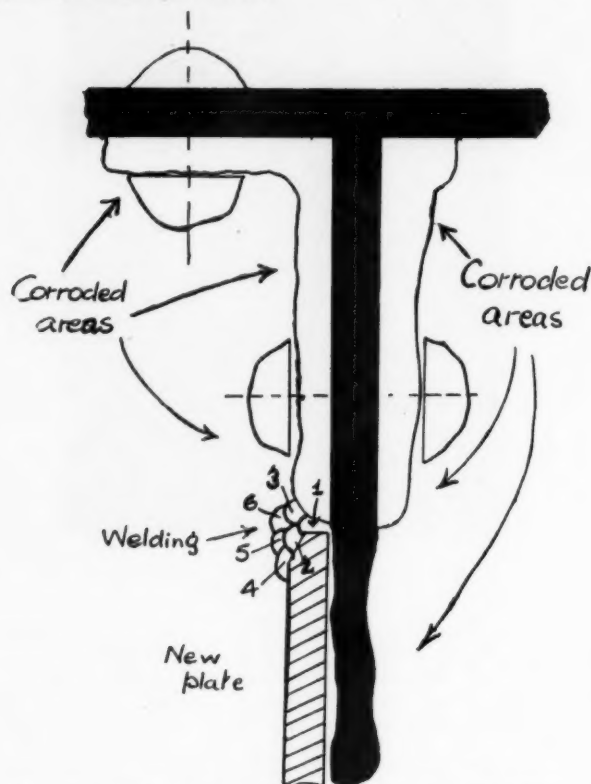
Fig. 4. Showing bare copper cables off which the positive leads to the regulator were tapped.

Quasi-Arc overhead and uranium electrodes were employed throughout, No. 12 gauge being used to secure good penetration on the inner runs, and No. 10 gauge on the outer runs. In order to keep the heat as low as possible all welding was carried out in intermittent runs especially in the vertical sides owing to the larger section runs that were possible. The horizontal sides were welded first. The total footage of

welding amounted to about 2,700-ft., and the electrode consumption to approximately 35,000-ft.

The girders were thoroughly scaled and cleaned before the new plates were applied, even so in each case the first run of welding proved somewhat uneven owing to the gaseous nature of the corroded wrought iron, and was required to be fullered down to present a sound and even surface for subsequent runs.

The staff employed consisted of four welders, a look-out, a man to look after the plant and an inspector. Generally the welding inspector has time to see to the plant as well. The welders erected and strutted the plates in position. The total working time amounted to 2,547 hours, averaging with four operators about 637 hours per welder.



Cross-section of New Welded Plates on Plate Girder Webs.

In order to prevent any possibility of corrosion occurring between the old and new webs, occasional holes were made in the old web after welding and hot tar forced between the plates.

A standard Quasi-Arc three-welder petrol driven generator with equipment for four welders was employed. The plant has sufficient capacity to supply four operators if no larger than No. 8 gauge electrodes are applied, which is always the case in this class of work. The set was stationed at the pier head and four bare copper cables, simply fixed to wooden supports which were tied to the pier railings, were employed as positive leads, as shown in Fig. 4. It will be noticed that the cables were insulated from the supports by small lengths of rubber tubing. The length of the central main girders which were strengthened was divided equally into four parts and each division allotted to one welder, so that it was only necessary for the first cable to reach to the end of the first quarter, the second half way, and so on.

The termination of the second cable can be seen in Fig. 4, and also an extension to one of the regulators, which were tapped off at the nearest point to the girder on which operations happened to be in progress at the time, through standard insulated cable. The girders and rails were used as negative return.

The furthest point welded was about 370 yards from the plant. The total petrol consumption was 1,460 gallons, averaging about two gallons per hour; 15 gallons of lubricating oil were used and 4 lbs. of grease.

It is difficult to estimate the great saving in cost effected by applying electric welding in this instance as practically the only other course possible would have entailed complete renewal of the girders. Needless to say this would have necessitated the closing down of each track separately for a very considerable time, which in itself would have meant loss of revenue, extra cost for employing pilot engines, flagmen, etc. In fact, it would have been out of the question during the busy summer months, so that such a course would have meant the work being carried out during the winter under very adverse conditions.

LARGE AMMONIA COMPRESSORS.

Three years ago a large German works installed a reciprocating ammonia compressor with a rated capacity of 16 million B.Th.U. per hour at an evaporating temperature of 23 degrees Fahr. and a liquefying temperature of 86 degrees Fahr. The compressor, which is of the Sulzer type, is driven direct

by a steam engine, developing 1,200 h.p. at 150 r.p.m. with a steam pressure of 340 lbs. per square inch. The following year the plant was enlarged by the addition of a turbo-compressor with a rated capacity of 32 million B.Th.U. per hour. A further plant is now being installed in the same works in the form of another Sulzer reciprocating compressor of 16 million B.Th.U. per hour at 150 r.p.m. The compressor is to be driven by an electric motor, the rotor of which serves as a flywheel.

MECHANICAL TAMPING OF CONCRETE.

Mechanical devices for tamping concrete in foundations and roadways have recently been patented, in which the tamper operates on the principle of an electrically driven vibrator. In the case of foundations and similar applications, the device consists of a motor with a weight welded on to the shaft, which sets up rapid vibrations as the motor runs at a speed of about 3,600 r.p.m. The motor is attached to a tamper of the required shape, while the whole apparatus is carried and held in position by two men by means of a spring-supported handle. In the case of tamping vertical surfaces, the device is slung from an overhead support and held against the work by one man, the tamper being free to swing where required. Where the tamper is used on curved surfaces, as in making concrete pipes, the tamping head is attached to a chain which is drawn around the form. Obviously such a device could only be used on fairly dry mixtures of concrete, and no advantage would be gained from mechanically tamping very wet mixes.

ELECTRIC OPERATION OF LIFTS AND ELEVATORS IN DOCK WAREHOUSES.

The advantages of the electric motor drive for lifts and elevators for the heaviest loads are generally recognised to-day, with the result that electric motors for such service have become practically standard and there is little need to elaborate the advantages of electric operation over other forms for this class of service.

The principal parts of any electrically-driven lift or elevator consist of the winding machine, the motor and the control gear. The winding machines may best be sub-divided into two main types, the traction type and the drum type. On the traction type the ropes are not rigidly attached to the driving sheave but pass over it, being in contact less than 180 degrees. In the drum type of winding machine one of the ropes is fixed to the winding drum, which has two sets of spiral grooves. One groove makes provision for winding and unwinding the rope to which the lift cage is attached, while the other groove accommodates the rope carrying the counterweight.

The size of the motor necessary for the operation of any particular lift depends upon three factors—the speed at which the elevator is to travel, the load to be raised, and the efficiency of the winding machine. The speed of the lift is, of course, determined by the service for which it is designed.

Goods lifts are commonly operated at a slow or moderate speed of between 80 and 150-ft. per minute. The cage and load are partially balanced as a rule by a counterweight, which is usually equal to the weight of the cage plus half the maximum load to be carried. Thus, no matter whether the cage is travelling up or down, or whether it is loaded or empty, the weight to be handled is never greater than half the maximum load for which the cage is designed.

As far as the motors are concerned, it is usually recommended that all d.c. motors be provided with a compound winding in order to produce a high starting torque, which is essential in elevator work. All the modern types of lift controllers are arranged to cut out the series field after starting, in order to make the motor a constant speed machine under varying loads.

Where the supply is a.c. the induction motor is commonly used, but while this is well adapted for some types of elevator service, it possesses certain limitations which must be taken into account. It is not possible to vary the speed of the standard induction motor under all conditions of load, nor is it possible to employ it with the dynamic braking feature.

The three ways of controlling an electrically-driven elevator are: 1, by hand rope; 2, by car switch; and 3, by push button.

Rope-operated d.c. elevator controllers are used with slow speed lifts for general goods service. A typical rope-operated reversing switch is the Igran type which is of the drum form with insulated square steel shaft. The drum, besides reversing the direction of rotation of the motor, also handles the control circuit of the automatic starter, but it is never called upon to break the main circuit. As an optional feature, dynamic braking may be provided in connection with this controller, in order to assist the solenoid brake in stopping the lift. When dynamic braking is used a field weakening device is provided and no field discharge resistance is then necessary.

The reversing drum should not be directly connected to the hand rope, but through a suitable chain or other gearing to a rope wheel, which in turn should have a countering device for the "off" position and two stopping points to limit the movement in each direction at the correct "running" position. If mechanical brakes are used, they must also be released when the rope wheel is in these positions. To the rope itself suitable stops are attached which cause the drum to be brought into the

"off" position by the lift cage when the top or bottom floor is approached.

For similar purposes but for the control of slip ring type induction motors on a.c. supply, equipments which were developed many years ago still find wide application. They consist of a rope operated reversing drum to which is attached by means of a crank and link the crosshead of a gravity type self-acting rotor starter. The movement of the drum from the central "off" position into either of the two "running" positions allows the crosshead to descend and thus cut out the liberally rated rotor starting resistance. An adjustable dashpot controls the time of acceleration of the motor.

The car switch operated d.c. lift controller, as far as goods elevators are concerned, are designed particularly for small service lifts, and is suitable for motors up to 3 h.p. on 110 volts, and 5 h.p. on 220 to 550 volts. The panel consists of a base on which are mounted two double-pole clapper switches mechanically interlocked for reversing the armature and a multiple finger self-starter for cutting out the starting resistance under the control of a dashpot. Four accelerating steps are provided as well as means for disconnecting the shunt field and the shunt brake in the "off" position. This controller is not designed with a slow down or dynamic brake.

The operation of this equipment is very simple. After the operator has shut the gate and so completed the control circuit by closing a gate switch, he moves the handle of the car switch in the direction required. The reversing contractors then close, the brake is lifted and the multiple finger self-starter commences to cut out the starting resistance. When the desired floor has been reached the operator throws the handle of the master drum into the "off" position; the brake is applied and the lift comes to rest. On the top or bottom landing the limit switches automatically prevent any over travel by interrupting the control circuit. When the operator leaves the car he can remove the handle from the master drum and so prevent use of the lift.

The small service lift can also be operated by push buttons.

Single phase a.c. motors are used only very occasionally for operating lifts, owing to the difficulty in obtaining a sufficiently high starting torque. For single phase slip ring type induction motors control gear similar to that used for poly-phase motors is used.

For this service a control panel such as the Igranic No. 1220 is popular. This panel carries two double pole mechanically interlocked reversing contactors, a number of accelerating contactors, and accelerating relay and control fuses. Powerful magnetic blow-outs are installed on the reversing contactors. The dashpot of the accelerating relay is provided with means for easy adjustment, and when once set will always cut out the resistance in the same length of time. The rotor currents are always balanced during the entire starting period.

Positive slow-down features cannot be embodied on account of the characteristic of the motors. Sometimes, however, provision is made to re-insert all the rotor starting resistance which slightly reduces the speed and avoids shocks when the brake is applied.

For high car speeds special two-speed motors have recently been designed. These motors are arranged with two separate primary windings. The customary speed range is three to one. The acceleration is handled automatically on the high speed winding. The slow speed winding is used when slowing down on approaching a floor.

The main features of a panel for an a.c. push button operated lift controller are generally the same as those already described for car switch operation. For two-floor lift controllers no extra relays are required on the panel. The accessories consist of the necessary push button stations and the two-floor limit switches, gate switches and other parts. If the elevator has to serve more than two floors the panel must be provided with the necessary floor relays, and for each intermediate floor a tappet-reversing switch must be fitted in the lift well.

One of the most successful brakes designed for use on a.c. is that in which a small torque motor is used for releasing the brake instead of a magnet. This is known as the Type RS brake, and is absolutely silent in operation. Type M brakes are suitable for d.c. Both these brakes were, however, described in some detail on page 250 of the June, 1928, issue of this paper, so that further mention here is unnecessary.

The Port of Grimsby.

On Tuesday, November 20th, the Grimsby Corporation gave notice of their intention to promote a Bill in the next Session of Parliament with regard to the proposed new fish dock at Grimsby. The question of building such a dock has long been contemplated by the old Great Central Railway Company, now the London and North Eastern Railway Company, but recently the Railway Company intimated to the trawler owners of the port that they were unable to raise the necessary capital. At the same time they suggested that if the Grimsby Corporation would be prepared to raise a loan and build the dock, they were prepared to pay as an annual instalment such an amount which would cover the interest and sinking fund and any other expense which might be incurred.

The question of promoting such a Bill was fully considered by the Grimsby Town Council on Monday night, November 19th, when the Mayor (Councillor M. G. Smith), in briefly summing up the position so far as had been arrived at, said that there were four aspects to consider. The first aspect was the question of necessity. With regard to that there had been some hesitating views, but he thought he could safely say that there was an overwhelming majority of opinion in favour of the extension of the fish dock as it was considered vital to the progress and prosperity of the town. The second aspect was security and that was the most important aspect. If they were going to make themselves responsible for such a large sum of money, they must of necessity feel themselves very adequately secured. The security which the Railway Company had offered was that of the revenue of the whole of the London and North-Eastern Railway Company. The third aspect was that terms had still to be agreed upon between the Railway Company and the trawler owners, and fourthly came the question of a grant which could not be definitely considered until the Bill was lodged.

The Borough Member (Councillor W. J. Womersley), who proposed that notice of the promotion of the Bill be given, this was the first time the Council had been in the position of making known to the public what exactly had been done with regard to the fish dock proposals and where the Corporation stood in the matter. He was satisfied, and most of them were, that a new dock was a necessity to the fishing industry of the port and a necessity if Grimsby was to grow and not remain stagnant or even go back. Certain other proposals had been put forward from time to time and these had been carefully considered by gentlemen in the industry and they had informed him that it was absolutely necessary, if the trade was to grow or even hold its own, that a new dock should be provided according to the plans submitted and approved. The Railway Company had had the project of building a dock for considerable time in their minds and it had been hoped that they would be able to carry out the project without having to call in any other outside assistance. However, they had informed the trawler owners that they were not in a position to raise the necessary capital and they had made the suggestion that if the Grimsby Corporation were prepared to find the money and build the dock they, on their part, would be prepared to reimburse the Corporation by way of a yearly rental what the Corporation had to pay in interest and sinking fund charges. To put it briefly there would be no cost to the ratepayers of the town. The Railway Company would reimburse the Corporation of every penny paid out. As regards the security he was satisfied with that offered by the Railway Company to the Corporation. He thought it the best they could get. The Company had offered the whole of their revenue and they would have the preference before the debenture holders. He was satisfied in his own mind that subject to slight alterations they would be perfectly secure and not be risking the ratepayers money in any direction. The Railway Company had said they could not go on with the building of the dock even if the Corporation could borrow the money unless they could come to an amicable arrangement with the trawler owners or users of the dock. It was now reported that at a meeting held between the two parties such terms were arrived at whereby it was hoped that there would be a settlement between them. Dealing with the question of a grant, Councillor Womersley said that in 1923 the Corporation tried to get a grant for this particular work on behalf of the Railway Company. They, however, failed on two counts. Firstly, the unemployment in Grimsby was not what was termed abnormal and, secondly, it was ruled that it was the Railway Company who were the proper people to apply for the grant, and even if such application was made it could not be considered. The Government had at last decided to wipe away certain difficulties which had confronted them in the past. The grant would be forthcoming as soon as the Bill had received sanction. Finally Councillor Womersley urged the Council to promote the Bill. Grimsby, he said, had one great asset, and that was her geographical position. This was second to none in the United Kingdom. Grimsby had also the finest market and they could only keep it up by keeping up the supply. This was Grimsby's opportunity and he hoped they would seize it.

Alderman T. C. Moss seconded the resolution and paid a tribute to the work of the Borough Member in the matter.

The financial side of the question was outlined by Alderman F. Barrett, Chairman of the Corporation Finance Committee, who expressed himself as being not so sanguine as the previous speakers. He was fortified, however, he said, by the statement of the Borough Member, in which he said the ratepayers would not suffer one penny piece. So long as they were to suffer no financial loss and the ratepayers would not be called upon to pay a penny piece, he was heart and soul in the matter.

The scheme is estimated to cost £1,388,000.

NEW LOCK GATES FOR PENARTH DOCK.

The Great Western Railway Co. have placed with Messrs. Vickers-Armstrongs, Limited, an order for a pair of steel lock gates for Penarth Dock.

Isle of Man Harbour Works.

Some interesting facts concerning the Douglas (I.O.M.) harbour works were communicated in the lecture given by Mr. J. C. Brown, civil engineer, at Douglas. The two sciences of harbour engineering and navigation, he said, stand to one another in the closest inter-relationship of cause and effect. Douglas Harbour could be divided into two distinct portions: (1) the inner harbour from the Red Pier inland and comprising an area of about 13 acres; and (2) the outer harbour extending from the Red Pier seaward. The inner harbour works consist of 4,000-ft. of walling, enclosing the area known as the Tongue. In section, the construction was typical of the old walling on the South Quay. It is founded on rock, previously prepared to receive the masonry. It is built of undressed stone, free from mortar joints, and its great bulk alone prevents it from being swept into the harbour from the great earth pressure behind it. The Tongue, too, is another example of the informal type of walling. Its badly-founded walls, filled between with earth, are unpretentious in appearance, and, according to modern theory, they should have tumbled down many years ago. However, with few exceptions, its whole length of 700-ft. has stood well, and greatly assists in the accommodation of the harbour. The most interesting portion of the walling, however, is to be found in the North Quay stretch. This quay had to be built on mud, and, as a foundation, great logs of timber measuring 12 to 14 inches square and 20 to 30-ft. long were embedded in this mud, and the stone wall erected upon them. The masonry was carried out with skill, and throughout great blocks of dressed limestone were used. Although no attempt was made to bed the stone in mortar joints, the wall has stood well. In all this 4,000-ft. of walling there exists in all about 20,000 tons of stone, and when one considers the lack of modern machinery for transporting and handling, this mass represents a colossal amount of work and energy for those who laboured in the past. Unfortunately, the walls were built with a forgivable lack of knowledge of the earth pressure exerted on such structures, and many isolated stretches have failed on this account. The foundations, too, are shallow, and any future deepening of the harbour is rendered excessively costly on this account, necessitating, as it would, extensive under-pinning or rebuilding.

The Red Pier construction may be regarded as the first maritime work in Douglas to be erected with any show of engineering design and skill. The shoreward section sea wall of sandstone and local stone was built continuously with hand-packed stone, and not as two distinct outer walls with centre filling. The whole of the outer surface is faced with dressed sandstone and, throughout the hearting, local stone was used, for reasons, no doubt, of economy. The sandstone, he understood, was imported from Annan on the Solway and Firth, and in the whole pier some 35,000 tons of material was used. Then there is the Fort Anne jetty—a work built later to complete, as far as possible, the protection of the harbour. It is an interesting structure and very skilfully built. The designer's object was to present such a surface seawards that the incoming wave should be deflected from the entrance and tumbled upon the rocks at its root. This face is beautifully symmetrical and skilfully shaped, and certainly achieves its object in deflecting the wave. The Victoria Pier, completed in 1871, was the first of the works to be thrust out into the sea. Like most of the maritime structures of to-day it is built in concrete. The introduction of Portland cement and consequent manufacture of concrete had revolutionised harbour works since the early eighteens.

Blocks of stone of large size were difficult to procure, expensive to dress, and equally expensive to convey and set in position. Concrete, on the other hand—which is simply a mixture of sand, broken stone, Portland cement and water—can be readily moulded in its plastic state in wooden moulds to blocks of any desired shape or size. This avoids all the elaborate masonry which characterised and distinguished works of a past generation. The first Douglas deep water work was built of great concrete blocks measuring 11-ft. long, 5-ft. wide, and 4-ft. deep, and weighing 15 tons each. Each block for the extension was cast to size in a wooden mould, stacked for a certain period to harden and mature, brought across the harbour by steam barge, picked up by a steam crane on the site and set in position. The two outer walls were built up from the sea-bed with cross walls tying the two at about every 40-ft. The great cavities, or pockets, as they are called, were then filled with quarry refuse up to deck level. The principal of the design is to erect walls just sufficiently strong to withstand the pressure exerted upon the back of the walls by the loose filling. In this way a minimum quantity of concrete is used to a large quantity of inexpensive filling, resulting in an economical structure. Unfortunately, this type of work is susceptible to sinkings taking place in the hearting.

The Victoria Pier extension, completed in 1891, and comprising the last 440-ft. of the existing pier, differs from the preceding portion in construction. It is solid work throughout, built of 15-ton blocks, and faced with dressed limestone to take the wear of shipping. This wall is free from fender piles, and has practically no projection at its base, and this introduces an example of how harbour works must keep pace with shipping

developments even to detail. The modern type of hull is practically square, with projecting bilge keels, and, but for the foresight of the designers of this latter portion of the pier in taking the walling down in the same straight line, well below low water, much expensive and awkward timber piling would have been necessary. The Victoria Pier, with its extension and widening, was completed at a cost of £110,000, and embodies more than 125,000 tons of material. The widening carried out on the south side in 1913 is essentially of modern design, and embodies ferro-concrete work. All the members of the structure, which are of concrete, are reinforced against bending stresses by means of iron rods buried in them.

So exact has the science of this subject of ferro-concrete become that the dimensions of each member can be calculated for a given load, thus reducing the quantity of material to a minimum and effecting economy in design. The whole of the members of this great framework were cast in wooden moulds, and its open piling has an excellent effect in riddling and breaking up incoming waves. It was the first maritime work of its kind in the Island, and has certainly proved a success.

The most important of the harbour works was the breakwater. He understood that the present breakwater is to be built upon the site of an old one, built on Abernethy's principal. Heavy timber piles are driven into the sea-bed, firmly braced together and planked, with joints, forming a great timber cage. This cage is then filled with large, broken stone, and sealed up. An example of this type of work may be seen to-day in the North Breakwater at Ramsey. In Douglas, however, it soon fell victim to the sea, with the result that the Battery Pier was built and completed in 1879 to the design of Sir John Coode. It cost £110,000, and in its length of over 700-ft. there exists some 100,000 tons of material. Some 25 years ago, failure became apparent in the inner quay wall—outward movement commenced and repairs became imperative. A series of holes were bored through the whole mass of the structure by means of diamond drills, and great iron tie rods passed through them. Plates were passed over each end of the rods and securely bolted up, literally tie-ing the walls together. With these works—the Victoria Pier and the breakwater—the artificial harbour is enclosed and protected, but unfortunately not protected from the easterly arc of the compass.

The outer bend of the present breakwater is to be removed, affording a straight quay to shipping, and the great arm running 800-ft. out into the sea is to overlap the Victoria Pier and shelter it from the disturbance of the waves. Its estimated cost of £750,000 can be readily understood when one considers that it is to be erected within the domain of the sea and submerged for the greater part of its bulk; subjected, too, to physical experiences of a nature very different from those which are characteristic of structures on land. Frequent inspections are necessary above and below water, particularly after heavy storms. Careful survey observations must be taken frequently to detect movement.

Copenhagen Harbour Finances.

Copenhagen as Transit Harbour.

The Budget for the year 1929 was submitted to a recent meeting of the Harbour Committee and approved. Some statistics of traffic were given as follows:—Imports from abroad in the first half-year of 1928, tons 1,755,857, an increase of 70,000 tons for the corresponding period of 1927. Imports from provincial ports, tons 285,000. Exports to provincial ports, tons 303,000. Exports abroad, tons 341,000, against tons 320,000 for the first six months of 1927. Imported goods amounted to three times as much as exported goods.

The subject of Copenhagen's importance as a transit port was discussed at the meeting. Mr. Johan Hansen, Director of the shipowners, C. K. Hansen, said that they were doing their best to develop transit trade, but the situation was extremely difficult on account of enormous competition from other harbours, not least from Hamburg, which was winning back its position as the chief transit port. He stated that freights and harbour dues were cheap enough in Copenhagen, but that wages were higher than in other competing foreign harbours. Admiral Richlieu was of the opinion that Copenhagen should be much more important as a transit port on account of its position and with the Baltic countries at its doors. One of the causes why Copenhagen had so little transit trade was that the depth of water was insufficient. The Kiel Canal had greater depth of water than Copenhagen Harbour which induced large ships to use that canal in preference to Copenhagen. Had the Copenhagen Harbour authorities taken up this question in time Copenhagen would now have a much larger transit trade. Mr. Johan Hansen agreed with Admiral Richlieu that they had missed their chance. Other speakers pointed out that the harbour was not suitable for the grain trade, that discharging was quicker in Hamburg, and that it was easier to get return freights in Hamburg than in Copenhagen.

American Harbour Personalities.

IV.—Colonel MARCEL GARSAUD.

New Orleans has three major problems which are unusual, if not unique, in their characteristics, and which have demanded the most expert engineering attention throughout 200 years of municipal growth and port expansion—drainage, levee maintenance and control of the river banks. They cannot be outgrown, nor permanently solved, except as to the individual projects of port development and industrial requirements as they occur. It is the great geographic advantage of its location and not its physical topography which has brought about the important commercial development of New Orleans. The site is flat, surrounded by water, practically at sea level, and two-thirds enveloped by the giant stream of the Mississippi, whose



Colonel MARCEL GARSAUD.

flood stages must be contained by levees and whose natural banks are possessed of vagaries which were the despair of earlier generations and have yet to be wholly controlled. The wharves and sheds of the port, accommodating at present about 11,000,000 tons of ocean shipping per annum, in addition to the requirements of river and lake transport, are built on top of the levees.

It is a matter then of present good fortune that the Board of Commissioners of the Port of New Orleans have as their general manager an executive who possesses an intimate knowledge of the port and its problems, an engineering knowledge in fact, combined with the other indispensable qualifications. Colonel Marcel Garsaud, who holds that position, has had long experience with the railroads of the South, with the general problems of the lakes and waterways of Louisiana, and with the Mississippi River, and the engineering problems of New Orleans in particular. He has been for many years in public office, and is by training and temperament qualified as the executive head of a port commission which has complete jurisdiction over the use of 41 miles of waterfront and which operates properties having a book value of \$50,000,000, including seven miles of shedded wharves, many major installations for the accommodation of special classes of commerce, and 5½ miles of deep-water canal devoted to industrial development.

Colonel Garsaud was educated in New Orleans and received his degree in civil engineering at Tulane University in 1903. Prior to the completion of his engineering course he already had spent several months as assistant engineer in railroad location and construction with the Texas and Pacific Railroad in Louisiana, and with the Louisville & Nashville Railroad in Alabama, and in this work he continued for some months after graduation.

Late in 1908 he returned to New Orleans and for the next five years he was assistant engineer and special assistant for the New Orleans Sewerage & Water Board, engaging in the design of sewers and having charge of the construction of sewerage

The Dock and Harbour Authority.

systems, deep excavations and pumping stations, involving a great deal of earth and concrete work. In 1908 he entered the general practice of his profession, spending a year in the design and erection of buildings in New Orleans, and the next eight years in design and cost estimating, for a time as superintendent in charge of construction, and later as an independent contractor on highways, wharves, earth canals, concrete canals, reinforced concrete work, pumping plants, bridges, embankments, pile-driving, and levees.

In 1917 he entered the engineer officers training camp at Fort Leavenworth, and on August 15th of that year was commissioned major, E.O.R.C. In June, 1918, he was commissioned lieutenant-colonel, N.A. Until September, 1919, he was with the A.E.F. in France, serving with the 1st Engineers, 108rd Engineers, and 312th Engineers, and on the special board of officers at Base 217, transferring American installations to the French. He was discharged September 30th, 1919, and made a colonel in the E.O.R.C., the grade he holds at the present time.

For five years after his discharge from the army Colonel Garsaud was again in private practice as consulting engineer and contractor. In August, 1924, he was appointed chief engineer of the Orleans Levee Board. This Board has full jurisdiction over levee construction and maintenance in Orleans Parish, which is co-extensive with the area of the city of New Orleans. Obviously it must work in co-operation and in harmony with the port commission, and each is an agency of the State of Louisiana. The responsibilities of the Levee Board are great, as the safety of the city depends on its constant vigilance and on levee construction of absolute stability.

During the time that Colonel Garsaud was with the Levee Board he was credited with many splendid accomplishments. Under his direction the Pointe-à-la-Hache spillway was created, combining with the Caernarvon crevasse to increase the flow of the river in 1927 and prevent any danger of inundation at New Orleans. The most important project of the Levee Board during his tenure was the Pontchartra in Lakeshore Development. The lake shores as well as river banks are the care of this Board, and the project in question, now in course of development, calls for the expenditure of \$27,000,000 in the reclamation of some 2,000 acres of land, with artificial beaches, playground and park areas, lagoons, roadways, residential and resort sections, all above the highest storm tide, and all within the limits of the City of New Orleans. The original plans were by Colonel Garsaud, and while these have been modified, there is every prospect that the general development will in all respects continue to follow the lines which he laid down.

On May 1st, 1926, Colonel Garsaud was chosen by the Board of Commissioners of the Port of New Orleans to succeed Commander John H. Walsh as their general manager. He accepted the position and for more than two years has actively promoted the best interests of the port, to the evident satisfaction of the Board and of the New Orleans public. Several of the most important waterfront projects have been carried out in this time, such as the \$2,000,000 green coffee terminal. Such improvements are the design of the Board's engineering department and are carried out under the supervision of that department, but the qualifications of the general manager as an engineer are an evident advantage, both in initiating installations for the use of goods and shipping, and in the adoption of the plans. The best accomplishments of Colonel Garsaud for the Board appear to have been the negotiations whereby several private shipside warehouses have been established to function in co-operation with the public wharves, and those other negotiations which resulted in the establishment of industries to operate over wharves controlled by the Board.

These last remarks are made, however, with a reservation. When the unprecedented flood stages of 1927 were experienced and disaster spread through a large portion of the Mississippi Valley—trade territory of New Orleans—flood protection immediately became the all-important concern of the city and of the port. The immediate danger of the wharves from advancing high water, and the possibility that the city levees might overflow, were removed by the creation of a natural crevasse below the city as recommended by Colonel Garsaud. This was made by the use of some 90,000 pounds of dynamite, increasing the flow at New Orleans by some 300,000 second-feet.

Not only did the Board lend the services of Colonel Garsaud to that immediate situation, but, with the emergency past, he was instructed to give his time and his efforts almost exclusively to aid in formation of a plan for national flood control and in obtaining the national legislation necessary therefor. The legislation was obtained and flood control in the Mississippi Valley was recognised as a national problem. The approved plan is now being carried out at a national cost of about \$400,000,000, and many of the distinctive features of that plan, especially for the lower river, such as the controlled spillways at the Atchafalaya River and at Bonnet Carré, are measures which were originally advocated and fought for by Colonel Garsaud.

There are at present pending in the councils of the port commission a number of projects for extending and improving port facilities which already are used practically to their maximum capacity, and for increasing the commerce of the port through

industrial expansion. Most important of these is the project for development of the swamp areas lying on either side of the Inner Harbour Navigation Canal. Those areas are practically all in the hands of private owners, and under the direction and leadership of Colonel Garsaud, State legislation has been obtained, which, if approved by the electorate in November, will permit the port commission to co-operate with such private owners in the development of a comprehensive plan for creation and improvement of industrial districts. This plan has been worked out by Colonel Garsaud for the Board with the co-operation of an advisory committee of representative citizens. Approval of the electorate is considered a foregone conclusion, and the exploitation of the development plan, with construction of canal laterals, elevation of industrial sites, laying of railroad tracks, hard-surfaced roads and power lines, will probably constitute the most ambitious programme of port expansion in the history of New Orleans harbour.

New Schemes at Hull.

The first portion of the new fish landing stage at the London and North Eastern Railway Company's St. Andrew's Dock, Hull, was brought into use on November 1st. The scheme, which also involves a double set of rails on the land side, is estimated to cost when completed £100,000, and it was intended, when begun last June, to push on the work as far as possible and thus suspend operations over the busy season. Under the supervision of the Docks Engineer (Mr. Wickham), however, the work has been expedited with such good effect that the first portion of the new quay space was completed within 143 days. It is now arranged that the work shall proceed without interruption and it is anticipated that by April an additional length of quay of about 200-ft. will be available for use in Good Friday week. The improvement will completely revolutionise the fish market arrangements at St. Andrew's Dock. The scheme, as a whole, provides for a new stage 1,200-ft. in length with offices, stores, etc., above the level of the floor space. The existing market accommodation has for a long time been inadequate to meet the requirements of the expanding fishing industry at Hull. Congestion has been frequent and the merchant's offices out of date. Besides the widening of the stage the rails alongside have been moved and new roads constructed for the despatch of fish trains. When the second portion has been finished further plans will be made to remodel the older portion of the market, but this cannot be carried out before the end of next year.

The coaling appliances at all the Humber ports are now being much more extensively used than in the earlier part of the year, thanks to the filp given to the export trade by the Five Counties Marketing Scheme. The exports (foreign) of coal have reached a level of 400,000 tons per month as against only 200,000 tons monthly in the January-April period, in addition to which shipments of bunkers are around 200,000 tons per month. The directors of the Scandinavian Coal Importers' Federation recently visited Hull and were most favourably impressed during their inspection of the electric coal conveyors, hoists, etc., with which the port is admirably equipped.

At a meeting on October 24th, the Hull City Council decided to promote a Bill in the current Session of Parliament to obtain power to construct a new pier and landing stage to accommodate the ferry traffic between Hull and North Lincolnshire. An amendment to defer the scheme for the preparation of further details was rejected by 47 votes to 8. The powers to be sought include the right to impose tolls on passengers and live stock. The proposal has been in the air some time and as it was foreseen that further delay might occur if the Corporation were to await a resumption of negotiations with the London and North Eastern Railway Company, the Property Committee resolved to push ahead with their proposals for a modified scheme which it is estimated will cost at least £100,000. What is now projected is to recondition the existing Corporation or Victoria Pier, and to construct an extension with a floating pontoon river-ward to the Humber Conservancy Line which marks the deep-water channel. By doing this it is hoped the modified scheme will be acceptable to the river craft and river Hull interests which primarily were the cause of a former and much more pretentious scheme being wrecked when submitted to a Town's Meeting. The fear was that it would not only make the approach from the Humber to the Hull difficult for sailing craft but would cause a branch to form and so silt up the old harbour. Another point is that the expenditure will be considerably curtailed and the possible charge to be borne by the local rates correspondingly reduced. As a set-off against this some revenue from tolls is counted upon providing Parliament gives consent. The London and North Eastern Railway Company whose sidings are employed in this cross-river traffic and who would use the new pontoon landing stage, are not at present jointly interested in the scheme (as was proposed in the earlier plan), but it is confidently expected that the Company will make some financial contribution to the cost. It was intimated by Sir Alfred Gelder that negotiations would be opened with the Humber Warehouse Co. and the London and North Eastern Railway Company for an extension of their frontage in

order to bring it into line with the new scheme. He also said that if power to levy tolls was refused the Corporation could go to the Ministry of Transport and apply for a grant towards the cost of the improved facilities provided in the public interest. Personally, he added, he believed they would be able to make a reasonable arrangement with the L. & N.E.R. Company and the other authorities concerned.

The Hull City Council, at a meeting on October 29th, had under discussion the question of the level crossings which are a feature of all the main roads at Hull and a source of annoyance, and in consequence to road traffic. The resolution, moved by Mr. Holmes, one of the Labour Councillors, was: "That the London and North Eastern Railway Company be requested to promote in the ensuing Session of Parliament a Bill in order to obtain powers for the carrying out of the scheme already approved for the abolition of the Hull level crossings, and that the Level Crossings Special Committee be instructed to renew negotiations with the Railway Company in respect of the amount to be contributed by the Corporation towards the cost of the scheme, and to make all possible endeavours with a view to obtaining a contribution from the Government." On the suggestion of Mr. Pearlman, the resolution was amended by deleting all reference to the promotion of a Bill, and was then carried unanimously. The subject is an old and recurring one in Hull and in recent years at least two favourable opportunities (one pre-War) have been let slip by. Three or four years ago when the existing scheme was formulated there were great hopes that the Ministry of Transport would grant some assistance, but more recently when application was made the Road Fund had been so much reduced that Sir Wilfred Ashley refused to concede to this question. The London and North Eastern Railway Company had promised to contribute £100,000, and the Hull Corporation were to provide the balance. The docks in the Eastern part of Hull are now connected by high level to the main railway, but such is not the case on the Western side. Neither is the passenger traffic so accommodated.

The Bridlington (East Yorkshire) Harbour Commissioners have appointed Lieutenant Edward Taylor, of Hull, as harbour master of Bridlington. There were 110 applicants, including three R.N. Commanders (retired), who regarded the Harbour Master's home as inadequate and unsanitary. It was reported that the Commissioners had approved the scheme of harbour improvement to cost £10,000 conditional upon a grant of £4,000 being forthcoming from the Treasury.

The question of making Hull an air port has been taken up energetically by the Hull Chamber of Commerce and Shipping, and 44 inland cities and towns have been circularised asking for support. The circular stated that the securing of an air mail service should be the pre-dominating feature of an air service between Hull and Northern and Central Europe. In the view of the Chamber a passenger service would follow. Hull, of course, is very favourably situated geographically on the East Coast and flying boats could cover the distance between the Humber and Copenhagen (for Northern Europe) and Hamburg (for Central Europe) in about four hours.

OBITUARY.

The Department of Overseas Trade regrets to announce the death, on November 8th, after a very brief illness, of Mr. R. W. Matthew, C.M.G., Director of the Trades, Empire and Economic Division of the Department. Mr. Matthew, who was only 49 years of age, joined the staff of the Department of Overseas Trade in December, 1917, after a successful career at the Board of Trade, where he had served as private secretary to four successive Presidents, Mr. Sydney Buxton (Lord Buxton), Mr. John Burns, Mr. Runciman and Sir Albert Stanley (Lord Ashfield).

His work at the Department of Overseas Trade will be well known to many of our readers, and especially to the Chambers of Commerce, with whom he was always in close touch.

SHIPPING TRAFFIC AT HAMBURG IN OCTOBER.

A report received by the Department of Overseas Trade from His Majesty's Consul-General, at Hamburg, states that there was little change in the total tonnage entered at the port during October, but the tonnage cleared declined by nearly 120,000 tons as compared with the previous month. The tonnage cleared with cargo showed a decline of 80,000 approximately. The total tonnage entered during the first ten months of 1928 exceeds the record figures during the same period of 1927 by 1,750,000 tons, and the total cleared similarly shows an increase of 1,800,000 tons.

British shipping in October consisted of 209 vessels (384,584 tons) entered and 205 vessels (376,047 tons) cleared compared with 211 vessels (382,605 tons) entered and 220 vessels (422,655 tons) cleared in September.

German tonnage in October amounted to 780,568 tons entered (787,279 tons in September) and 806,151 tons cleared (827,350 tons in September).

Personal enquiries regarding shipping and transport matters should be made at the City Office of the Department (Shipping and Transport Section), 73, Basinghall Street, London, E.C.2.

Harbour Structures.

IV.—Molluscan Borers.

By WILLIAM G. ATWOOD, Consulting Engineer,
New York.

The molluscan borers cause greater damage to wooden structures in salt water than all other deteriorating influences. While their destructive work has been recognised since men first used waterways for transportation it has only been within the last few years that engineers and pure scientists have made a concerted effort to systematically study the whole subject.

The tail of the animal is anchored to the timber at the entrance hole and as the boring progresses the hole is lined with a smooth nacreous lining which enables the animal to easily move back and forth in the burrow.

The boring mechanism consists of the shells and foot on the head of the animal.

The foot is a round, soft suction organ between the shells by means of which the head and shells are held tightly against the wood while boring.

The shells are pivoted on rocker arms and are actuated by powerful muscles. Their outer surface is serrated with a large number of teeth not unlike those of a wood rasp in form. These teeth, of course, wear, but are replaced by growth and on the forward end of the shells are sharp.

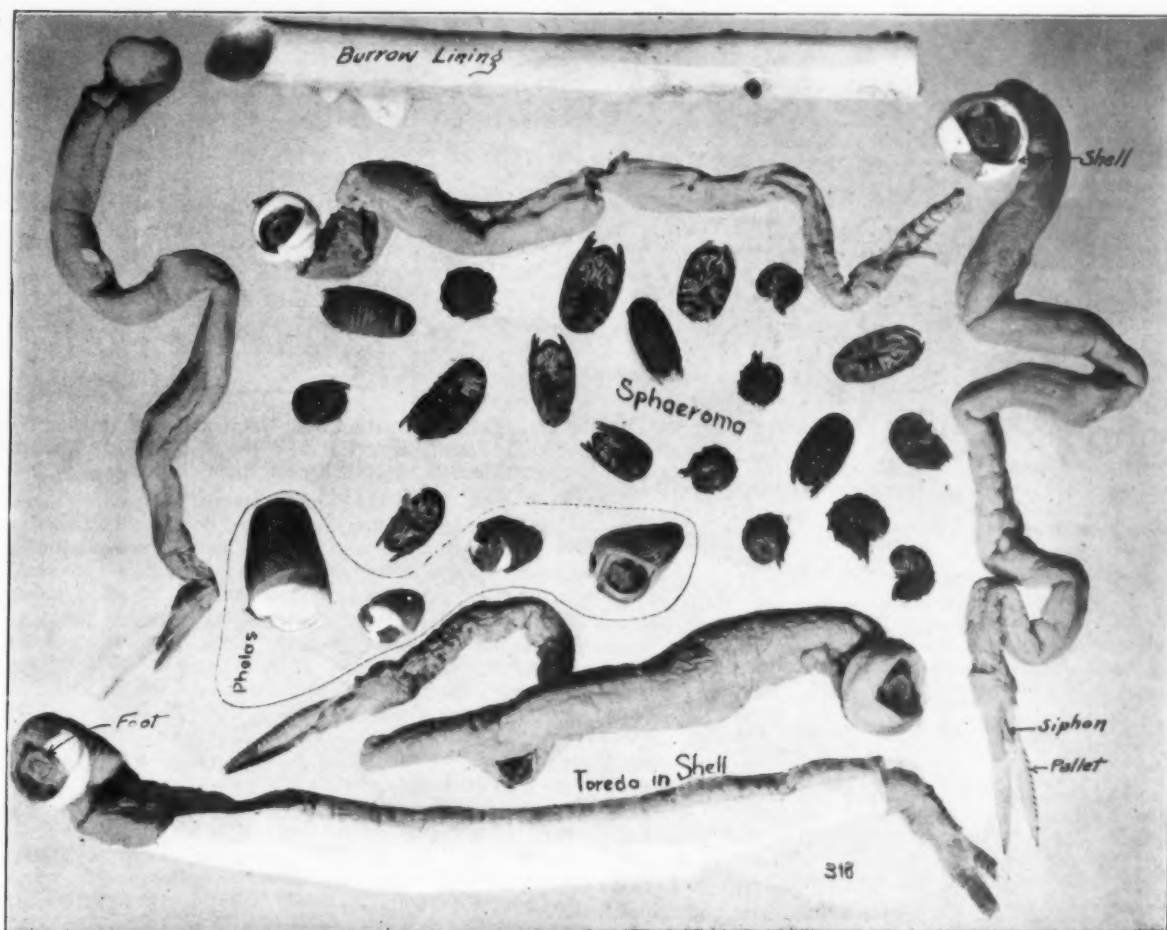


Fig. 1. Bankia, Martesia (Pholad) and Sphaeroma.

It was first necessary for the engineers to learn from the biologists what animals were causing the damage and for the biologists to learn from the engineers how serious the problem was.

There are three genera of molluscs of importance, *Teredo*, *Bankia* and *Martesia*.

The first two of these are very similar in appearance, with the same method of attack while the *Martesia* has entirely different characteristics. There are a number of species of each genus and since these species differ in their range and capacity for destruction it is important to the engineer as well as the biologist that these specific differences be recognised. (Fig. 1).

The *Teredo* and *Bankia* have elongated worm-like bodies. The shells on the heads of the animals form the boring mechanism; the tails are supplied with two organs, the siphons and pallets.

The siphons are a pair of muscular tubes through one of which, the incurrent, the water containing the oxygen and minute organisms used for food are drawn into the body. This water, after the extraction of the oxygen by the gills and the food values by the digestive organs passes out through the ex-current siphon. The body wastes and the sawdust produced by the boring are also carried out by this stream.

The siphons when active project through the minute hole through which the animal entered the timber sometimes as much as 1½-in. and when in this condition a heavily-infested pile looks as though it was covered by gray moss. When for any reason the animal is not active the siphons are frequently retracted and do not show on the surface.

The pallets are calcareous bodies of various shapes used to plug the entrance hole when danger threatens from any cause or when for any reason the animal desires to close the entrance hole. When the pallets are retracted the siphons are generally extended and when the pallets are pushed outward to plug the hole the siphons must be retracted (Fig. 1).

When boring is going on the shells are held against the wood by the suction foot and slowly rocked back and forth by their actuating muscles thus rasping away the wood. The particles thus rasped away pass through the mouth of the digestive tract and thence out through the excurrent siphon.

The principal food of the molluscan borers is furnished by the minute organisms in sea water, but in case of the *Teredo* and *Bankia* a part of the food is obtained from the wood excavated by the shells. The question as to whether any food value was obtained from the excavated wood has been much debated by biologists, but seems to have been finally settled by the studies made in the laboratories of the University of California in 1922 and 1923.

Biologists generally determine the species of *Teredo* and *Bankia* by the shape and character of the pallets. The former genus generally has a solid body of various shapes on a stem, while the latter has a segmented structure. Generally speaking the method of reproduction of the two genera are different. The female of the *Bankia* ejects the eggs into the water where they may be fertilized while in most species of *Teredo* eggs are fertilized within the female and the young are ejected as free swimming organisms. An active female of either genus may produce as many as 1,000,000 young per season.

The young in their free swimming stage float and swim for varying periods until they come in contact with a satisfactory piece of timber, or become too heavy to float longer, when they land and immediately commence boring, if on timber. A day or two is sufficient time for them to bury themselves.

The rate of growth varies greatly with the species and the surrounding conditions. The *Teredo navalis*, the commonest species of this genus in both the United States and Europe, will seldom grow longer than 8-in. though specimens have been found 20-in. long, while the *Bankia setacea* on the Pacific Coast of the United States not infrequently reaches a length of 3 and very infrequently 4-ft. The diameter of the burrow of the

Teredo navalis seldom exceeds $\frac{1}{2}$ -in., while a diameter of $\frac{1}{8}$ -in. is recorded for *Bankia setacea*. Under favourable conditions the rate of growth may be 3 or 4-in. per month. The largest specimen of which the writer has heard is in the museum of the Institute of Civil Engineers, and was found on one of the Pacific Islands. It is slightly under 3-in. in diameter and 3-ft. long.

None of these molluscan borers are active throughout the year and each species seems to have a different period of activity. The length of this period for a given species varies in different locations and seems to be influenced by water temperature, salinity and perhaps other factors. If a given harbour be infested by only one species of borer the period of activity will under the most favourable conditions hardly exceed from six to eight months, while it frequently does not exceed as many weeks. If there be several species present with differing periods and these periods overlap it will be found that some species will be active at all times and therefore that destruction goes on continuously.

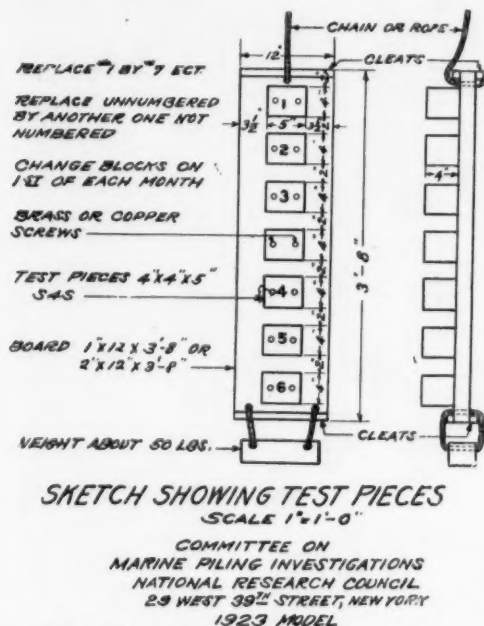


Fig. 2. Test Board Model 1923. One numbered and one unnumbered block were removed each month.

It is necessary, therefore, in making a thorough study of a given harbour to know what species are present and what their various periods of activity are. The method used in the investigation by the committee of the National Research Council of the United States was very effective. A test board was made with seven removable blocks (Fig. 2) and anchored a few feet off the bottom at a point where conditions were favourable for borer action. This board was raised each month, the centre block and one other removed and replaced by new blocks. The numbered block removed was the one which had been in place the longest. By this method it was possible to ascertain what species were active each month and the cumulative result of attack for a period of six months. These blocks were sent to biological laboratories for examination and it was found that if they were well wrapped in heavy paper that the borers were generally alive after ten days or two weeks' travel.

Martesia on account of its more limited distribution has received much less study than the other two genera. It has so far been found only in tropical or semi-tropical waters, and is generally less destructive than the teredine borers. The only place in which *Martesia* is known to be more destructive is in Manila Bay, though in some locations in Tampa Bay, Florida, it seems to do about as much damage as do the *Teredo* and *Bankia*.

Martesia bores with its shell just as do the teredine borers, but because of its body being wholly enclosed within the shells or for some other reason the chemical means of protection which are effective against the other genera do not seem to be effective against it. It is capable of causing great injury to structures, even those protected by creosoting in harbours where it exists.

For the best results from the standpoint of economical construction and maintenance each harbour should be studied by the use of test boards so that the distribution of borers can be known and any changes can be recorded. The reason for the changes in the distribution and activity of borers is little known and therefore is hard to predict.

Some species of the teredine borers are found only in water of full salinity (about 36 parts per 1,000) while a few others have been found in fresh water, notably in Miraflores Lake in the Panama Canal zone and in the Ganges River. It was for a long time supposed that the commoner species required high salinity, but it has now been demonstrated that the *Teredo navalis* will bore actively in salinity down to about 8 or 9 parts

per 1,000, will live with little or no growth or boring to about 5 or 6 parts and will live for at least 30 days in fresh water, and after this period will revive and continue boring if sufficiently high salinity exists. *Bankia gouldi*, a widely-distributed species on the eastern and southern coasts of the United States, has not been so carefully studied, but indications are that it has about the same tolerance for changes in salinity.

Most borers seem to have a high resistance to some types of pollution. Many cases are recorded where wooden sewer outfalls have been destroyed and others where heavy destruction occurred in structures located in water polluted by sewage and industrial wastes. In bodies of water where long continued pollution has existed a condition seems to be created not so favourable. This is the case in New York Harbour which has been highly polluted for many years. Though borers were at one time quite destructive they have generally disappeared from the inner harbour though a few of them are occasionally found. Strangely enough the two points in the inner harbour where they are quite active are in the outfall of the Passaic Valley sewer and in the Standard Oil piers at Bayonne, N.J.

So little is known as to the reason for the distribution and variation in the activities of borers that it behoves the engineer to be very cautious in his design and in the selection of materials of construction.

Methods of protection will be considered in the next article of this series.

Book Review.

The Design, Construction and Maintenance of Docks, Wharves and Piers. By F. M. Du-Plat-Taylor, M.Inst.C.E., M.I.Mech.E., etc. (Ernest Benn, Ltd., 70s.).

This work is a comprehensive treatise on modern methods of accommodating shipping in enclosed docks and at wharves and piers in tidal waters, and the author brings the subject thoroughly up-to-date with the presentation of the latest tendencies, developments and practice.

Major Du-Plat-Taylor has spent his whole life as a dock engineer, at Liverpool, the London and India Docks Company, and the Port of London Authority, and is now engaged as a consulting engineer in Westminster. He is thus in an authoritative position for dealing with the subject.

At the outset the writer gives a chapter on the harbours of the ancients, and in passing to the discussion of organisation and management of docks and ports of Great Britain and foreign countries arrives at conclusions concerning the administration best suited to modern times.

In Chapters III. and IV.—Form of Accommodation, Tidal or Impounded, the author describes the race between ship-owners and dock and harbour authorities and the deficiency of dock and harbour accommodation in the past.

The significance of the increase in size of ships and the enhanced cost of engineering works is dealt with, and with special reference thereto there is discussed the relative advantages and disadvantages of enclosed docks and tidal wharves and piers for the accommodation of ships.

A chapter on calculations for dock walls is included in the work, and several sections deal lengthily with the design and construction of dock and wharf walls, jetties and landing stages, in their diversity, touching upon the latest types and methods of construction.

The subject of dry docks and floating docks, from the design and construction points of view, is gone into in Chapters XI. and XII.; while Chapter XIII. is upon lock gates, gate machinery, caissons and sluices.

There are sections devoted to dock and wharf buildings, dredging and dredging plant, construction—materials; organisation of works; dams, temporary work and plant; while a wide and important subject—equipment and fittings of docks, i.e., dock and wharf machinery, dry dock pumps, refrigerating plant, cranes, conveying and elevating, hydraulic and electric machinery, are fully treated by the author.

Major Du-Plat-Taylor concludes with a chapter on maintenance of docks, which, as in all other concerns, represents a heavy annual charge, and is of particular interest in these times of high cost, whether from the manager's or engineer's point of view.

The book is well illustrated with diagrams, drawings and photographs, the subjects of which are of the most modern and up-to-date character.

Dock engineering, as the author points out in his preface, covers probably more ground than any other branch of the engineering profession, and considering the immensity of the subject Major Taylor is to be congratulated upon providing a work of such interest and comprehensive character for the guidance of all connected with docks and wharves and the accommodation and discharging of ships, whether they be engineers or concerned with administration and management.

Port of London Authority.

Nineteenth Annual Report for the Year ended 31st March, 1928.

The following is a list of members at 31st March, 1928:—

Right Hon. Lord Ritchie of Dundee, Chairman.
Charles Frederick Leach, Vice-Chairman.

Allen, Frederick Charles; Bellamy, Frederic William; Benn, Captain Sir Ion Hamilton, Bart., C.B., D.S.O., T.D.; Blake, Jack Percy; Bolton, Louis Hamilton; Boyle, Admiral The Hon. Sir Algernon Douglas Edward Harry, K.C.B., C.M.G., M.V.O.; Cory-Wright, Sir Arthur Cory, Bart., J.P.; Devenay, William, J.P.; Francis, John Morgan Richards, J.P.; Gilbert, James Daniel, D.L., J.P.; Glover, John Howard; Golding, Captain Thomas, C.B.E.; Gosling, Harry, C.H., M.P.

Greenwood, Hubert John, D.L., J.P.; Guthrie, Charles Seton Sinclair; Jones, David, J.P.; Learmonth, Admiral Sir Frederick Charles, K.B.E., C.B.; Lloyd, Edward Aubrey; McAlister, William James; McLeod, Sir Charles Campbell, Bart.; Millett, Captain John Lester Vivian; Murray, Archibald; Smith, Owen Hugh; Turner, Sir Montagu Cornish; Wiles, Right Hon. Thomas, P.C.; Wrightson, William Lee.

The total net register tonnage of vessels that entered and left the Port of London with cargoes and in ballast from and to foreign countries and British Possessions and coastwise during the years ended 31st December, 1913-1927, was as follows:—

	Tons.		Tons.
1913 ...	40,080,282	1921 ...	34,089,783
1914 ...	37,154,133	1922 ...	39,293,139
1915 ...	30,890,531	1923 ...	41,215,062
1916 ...	24,976,437	1924 ...	45,392,649
1917 ...	18,053,002	1925 ...	47,064,975
1918 ...	14,564,008	1926 ...	49,278,173
1919 ...	26,335,191	1927 ...	52,576,755
1920 ...	32,758,604		

The totals for the years 1914 to 1918 do not include the tonnage of many of the vessels engaged on Government service in connection with the war.

The net register and deck cargo tonnage of shipping that entered and left and paid river tonnage dues during the twelve months ended 31st March, 1928 and 1927, respectively, was as follows:—

	1928.	1927.	Percentage Increase or Decrease.
Foreign (Inwards)	19,945,864	21,128,481	6.1
(Outwards)	10,792,100	9,475,715	13.9
	30,637,964	30,604,196	0.1
Coastwise (Inwards)	6,624,929	3,761,167	76.1
(Outwards)	2,370,384	2,171,719	9.1
	8,995,313	5,932,886	51.6
	39,633,277	36,537,092	8.5

There was thus an advance of 3,096,195 tons, composed of an increase of 33,768 tons in the foreign and 3,062,427 tons in the coastwise trade.

Of the total net register and deck cargo tonnage of shipping shown above, 61.9 per cent. used the wet docks of the Authority, compared with 61.3 per cent during the twelve months preceding:—

	1928.	1927.	Percentage Increase.
Foreign (Inwards)	14,438,384	13,563,836	6.4
(Outwards)	8,134,063	7,354,417	10.6
	22,572,447	20,918,253	7.9
Coastwise (Inwards)	1,178,880	821,279	43.5
(Outwards)	785,404	648,190	21.2
	1,964,284	1,469,469	33.7
	24,536,731	22,387,722	9.6

The shipping entering the dry docks of the authority during the twelve months was 216,646 tons less than that of the previous year, viz.:—

1928.	1927.
Tons gross.	Tons gross.
2,797,440	3,014,086

The values of the total imports and exports (excluding coastwise goods) of the United Kingdom and six principal ports for the year ended 31st December, 1927, were as follows:

	1927.	1926.	Percentage Increase or Decrease.
United Kingdom ...	2,050,374,661	2,019,903,154	1.5
London (including Queenborough)	706,134,199	701,606,122	0.6
Liverpool ...	481,216,910	508,000,721	5.3
Hull ...	108,483,328	105,457,221	2.9
Manchester (including Runcorn)...	94,438,743	96,448,534	2.1
Southampton ...	90,253,406	87,048,798	3.7
Glasgow ...	77,364,314	79,681,416	2.9

During the twelve months ended 31st March, 1928, the authority landed or received 2,338,111 tons of import goods for warehousing or for immediate delivery, a decrease of 248,857 tons, or 9.6 per cent., on the tonnage dealt with during the previous twelve months.

The stocks of goods at the end of March, 1928, in the warehouses directly controlled by the authority amounted to

617,557 tons, as compared with 595,013 tons at the corresponding date in 1927, an increase of 22,544 tons.

The export traffic handled on the dock quays during the twelve months amounted to 700,012 tons, being an increase of 28,434 tons on the previous years figure of 671,578 tons.

FINANCE.

On the 9th December, 1927, the authority created and issued at the price of £99 per cent. £3,000,000 Port of London 5 per cent. Inscribed Stock redeemable at part on the 1st June, 1970, the authority having the option of redeeming the stock in whole or in part at par on or after 1st June, 1950, on giving six months' notice. The issue was made chiefly for the purpose of paying off temporary loans to meet capital expenditure on the improvement and development of the facilities of the port. The stock ranks as to security *pari passu* with the 3½ per cent., 4 per cent., 4½ per cent. and 6 per cent. Inscribed Stocks, and the "B" Port Stock already issued.

The balance of borrowing powers by means of the issue of Port Stock remaining unexercised at 31st March, 1928, amounted to £3,513,548, as follows:—

Port Stock authorised to be issued ...	37,656,246
Port Stock issued and outstanding ...	34,142,698
	<u>£3,513,548</u>

In order to increase the borrowing powers of the authority a clause was inserted in the Port of London Bill of this session which will enable the authority to borrow to a total not exceeding £43,000,000.

Bills to an amount of £1,000,000 outstanding at 31st March 1927, matured on the 12th July, 1927, and were paid off. A further issue was made on the 12th July, 1927, of £1,000,000 six months' Bills, which were paid off on the 12th January, 1928.

Temporary loans were obtained during the year and an amount of £262,000 was outstanding at 31st March, 1928.

The capital expenditure for the year ended 31st March, 1928, amounted to £1,829,081.

Detailed particulars of works completed during the year and in progress at 31st March, 1928, will be found in the section of the report devoted to Works and Improvements.

The authority has had under consideration during the past year the advisability of transferring the unappropriated credits on capital account (the accumulated amount of which at 31st March, 1927, was £756,637 16s. 3d.) to various funds for the Redemption of Port Stock, etc.

This transfer has now been effected by extinguishing the expenditure on capital account for "Provision for Lay-Byes" (amounting at 31st March, 1927, to £125,250 13s. 6d.), and crediting the balance of £631,387 2s. 9d., together with other amounts arising during the year to various Redemption Funds. Certain of the Redemption Funds have thus been filled up resulting in an immediate reduction in the annual Redemption Fund contributions.

By the appropriation of these capital credits to Redemption Fund Accounts the authority has been enabled to use the sum of £1,000,000 for capital purposes.

The powers conferred on the authority by the Port of London Stock Regulations have also been exercised by the cancellation of the following Port Stock, representing investments of moneys standing to the credit of certain Redemption Fund Accounts:

3 per cent. "A" Port Stock, 1929-99 ...	136,314	0	0
4 per cent. "B" Port Stock, 1929-99 ...	207,232	6	7
3½ per cent. Inscribed Port Stock, 1949-99	104,215	0	0
	<u>£447,761</u>	<u>6</u>	<u>7</u>

The amount standing to the credit of the Sinking Funds for the redemption of Port Stock, etc., at 31st March, 1928, was £1,286,262. The investments held on account of these funds stand in the books at a value of £1,017,464, leaving a balance of £268,798 uninvested.

Supplementary to the statutory requirements in regard to Port Stock, provisional Sinking Funds are in operation for the redemption of certain expenditure in respect of which borrowing powers have not yet been exercised. The balance of these Sinking Funds amounted at 31st March, 1928, to £115,399.

The following is a summary of the year's working:—

Total Revenue ...	6,122,207
Total Expenditure ...	4,774,659
Balance of Revenue ...	1,347,548
Less—	
Interest on Port Stock and Temporary Loans, Sinking Fund Charges, Insurance Fund Appropriation, etc., less Interest, etc., receivable	1,430,785
Deficit ...	83,237
Balance brought forward from 31st March, 1927 ...	674,636
Balance carried forward ...	<u>£591,399</u>

The balance standing to the credit of this Fund at the commencement of the year was ...	1,696,490
from whence there has been deducted the actual expenditure during the year chargeable against the Fund	708,637
leaving a balance to be carried forward at 31st March, 1928, of	£987,853

The amount of the Reserve Fund remains at £1,000,000, this being the statutory maximum prescribed by Section 107 (1) of the Port of London (Consolidation) Act, 1920, and is fully invested in Trustee securities which stand in the books at less than mean market prices at 31st March, 1928. The Fund reached the maximum during the year ended 31st March, 1922, and since that date the interest on the investments has been credited to Net Revenue Account.

The Ministry of Transport re-appointed Sir William Plender, Bart., G.B.E., of the firm of Deloitte, Plender, Griffiths and Co., to be auditor of the accounts of the authority for the year ended 31st March, 1928, in accordance with the provisions of Section 109 of the Port of London (Consolidation) Act, 1920.

WORKS AND IMPROVEMENTS.

The progress of the improvement works has been well maintained.

LONDON DOCK.

The new quay and single-storey shed at West Quay, Wapping Basin, has been completed and brought into use.

INDIA AND MILLWALL DOCKS.

Stage 1.

(a) A communication passage, 80-ft. wide, between the South-West India Dock and Millwall Dock.

(b) A cutting, 350-ft. wide, through the quay between South-West India Dock and the West India Export Dock.

(c) A communication passage, 80-ft. wide, with a bellmouth at the north end between the West India Export and Import Docks.

(d) Re-modelling of railway lines.

The works referred to in paragraphs (b) and (d) have been finished, and those in (a) and (c) are approaching completion.

Stage 2.

(a) New Entrance Lock, 590-ft. long, 80-ft. wide, 35-ft. deep below T.H.W., approximately on the site of the existing South-West India Dock Entrance.

(b) Filling in of the existing passage between the Blackwall Basin and the Export Dock and removal of the knuckles between the South Dock and the Basin.

A contract has been placed for the carrying out of this section and good progress has been made with the work.

Stage 3.

Diversion of the goods railways between the Exchange Sidings and the Millwall Dock to the west side of the West India Dock to avoid crossing the New Entrance Lock.

A contract has been placed and the work is proceeding.

SURREY COMMERCIAL DOCKS.

In order to provide additional under-cover storage accommodation for soft wood the authority undertook the construction of three sheds at Surrey Commercial Docks, as a first instalment, at an estimated cost of £52,500.

ROYAL VICTORIA DOCK.

The new berth for dealing with chilled meat on the north side of the canal between the Royal Victoria and Albert Docks with sheds and equipment has been completed.

TILBURY DOCKS.

New Entrance Lock, 1,000-ft. long, 110-ft. wide and 45½-ft. below T.H.W., situated 1,200-ft. above Tilburyness.

New Dry Dock at the eastern end of the Tilbury Main Dock, 750-ft. long, 110-ft. wide, 37½-ft. below T.H.W., on sill and blocks.

The monoliths for the entrance lock and dry dock have been completed and the walls and floors are well advanced. Substantial progress has been made with the jetties at the lock entrance and the lockgates. Contracts have been entered into for the caisson as well as the pumping and other machinery for the dry dock.

The authority decided upon the construction of a new western approach road to afford access to the South Quay, Tilbury Docks, at a cost estimated at £31,900.

The equipment of the berth at Tilbury Docks Basin for the new Tilbury-Dunkirk steamship service has been completed and brought into use.

TILBURY PASSENGER LANDING STAGE 1,140FT. LONG, WITH BAGGAGE HALL, ETC.

These works have been delayed by a strike at the contractors' works. The first section of the stage, 300-ft. in length, for the Tilbury-Gravesend ferry service will be placed in position immediately and work on the remainder is proceeding.

Substantial progress has been made with the sub-structure for the baggage hall.

DREDGING.

During the year 2,123,099 cubic yards of material were removed from the river to maintain and deepen the channels.

The quantity of mud removed from the docks during the year was 1,324,054 cubic yards.

The authority's dredging programme for a channel not less than 1,000-ft. wide and 30-ft. deep at L.W.O.S.T., from the seaward limit of the port to Cold Harbour Point, a distance of over 33 miles, and 600-ft. wide and 27-ft. deep at L.W.O.S.T. from Cold Harbour Point to King George V. Dock, a distance of over 6 miles has now been completed.

Special dredging has been undertaken at the lower end of Lower Hope Reach to facilitate the manœuvring of deep draught vessels, and at Crossness the radius of channel has been improved while the width has been increased.

Above the King George V. Dock dredging has been continued for the improvement of Bugsby's Reach.

The authority has arranged for the removal and disposal at sea of material dredged by them from the river to be carried out by contract after 31st March, 1928, and for all plant surplus to their requirements to be disposed of.

The authority decided to dredge the Surrey Canal throughout its length, and about one-third of the work has been completed.

GENERAL.

A considerable advance has been made with the programme for bringing the undertaking and its equipment into an adequate state of repair and an up-to-date condition. Further authorisations in pursuance of this policy have been made for the ensuing year.

The 150-ton floating crane "London Mammoth" has been completed and brought into use.

A floating electric generating station has been purchased and is available for use in emergency.

The authority has undertaken the provision in lieu of the Old Swan Pier, near London Bridge, of a new steamboat floating pier off the Tower of London.

GENERAL.

On the 1st August, 1927, a further reduction was made in the following dock charges by increasing the then 7½ per cent. reduction on the schedule charges to 10 per cent.:-

Shipping.—Dock dues and additional rent. Discharging and extra charges.

Goods (other than frozen meat, butter and cheese in cold storage).—Imports—Landing and extra charges (other than rent). Exports—Charges (other than rent).

Reductions were also made in the cold storage rates on frozen meat, butter and cheese, and in the rates on goods brought to the docks for export.

To facilitate the construction of the proposed New Victoria Dock Road the authority has arranged with the Ministry of Transport to give about 23 acres of land north of the Royal Albert Dock for the purpose of a housing scheme to replace certain dwellings which will be demolished. It is proposed that the new road shall pass over the western entrance to the Royal Victoria Dock at such height as to permit of barges without masts passing through that entrance.

A quarantine station for cattle for export to South Africa has been established under the administration of the Royal Agricultural Society at the East India Dock.

A "Safety First" organisation for the docks and warehouses has been established, and local committees comprising representatives of the authority's supervisory staff and of the workpeople have been appointed.

Fifty-three vessels were removed from the river by the wreck raising plant during the year, viz.:—1 steamer measuring 181 tons, 3 steam tugs measuring 135 tons, 47 sailing vessels and barges measuring 2,305 tons, and 2 small craft. In addition, 13 sailing vessels and barges measuring 612 tons were raised in the docks.

For the purpose of complying with the provisions of the Petroleum Act, 1926, the authority revised their Petroleum Bye-laws so as to make them applicable to the loading as well as the landing of petroleum spirit, and, as the result of an application from certain companies engaged in the petroleum trade, the authority at the same time amended the existing bye-laws so as no longer to restrict the navigation of ships carrying petroleum spirit to those parts of the Thames eastward of the Mucking Light, but to permit the navigation of such ships up to Crayfordness.

The amended bye-laws were submitted for confirmation to the Minister of Transport, who deemed it desirable that a public enquiry should be held into the matter in view of objections to and representations in support of the bye-laws which were received.

The Minister accordingly appointed Major T. H. Crozier, H.M. Chief Inspector of Explosives, and Professor J. S. S. Brame of the Royal Naval College, Greenwich, to hold the enquiry which was opened at the authority's offices on the 13th

December, 1927, and was concluded on the 22nd February, 1928.

The decision of the Minister has not yet been made known.

The authority has to record an abnormal rise in the height of the waters of the Thames at high tide on the early morning of the 7th January, 1928, which resulted in loss of life and damage to property.

The tide reached the unprecedented level of 18-ft. 3-in. above Ordnance Datum at London Bridge at 1.8 a.m., which level was 5-ft. 10-in. above the predicted height and 11-in. higher than that of 1881, which was the highest previously recorded.

From the information available the occurrence was attributable to a combination of the following causes:—(a) a spring tide, (b) the raising of the water in the Estuary by meteorological conditions in the North Sea, viz., a strong north-westerly gale over the North Sea accompanied by a westerly gale in the Channel, and (c) flood waters from the Upper Thames.

After the disaster a conference of certain Government departments and public authorities was summoned at the instance of the Prime Minister to review the situation and to determine what action should be taken to obviate any recurrence of such loss of life and property. The conference was held at the Ministry of Health on the 16th January, the authority being represented thereat by their chairman and the mechanical and maintenance engineer.

The conference appointed a committee "to examine in detail the matter discussed at the meeting, particularly the broad causes of the disaster, the question of the probability of the recurrence of such an abnormally high tide as that of the 6th and 7th January, 1928, and the giving of warnings." Representatives of the authority attended the meetings of the committee.

The report of the committee, dated 22nd February, 1928, has been presented to Parliament by the Minister of Health.

A Bill was deposited in Parliament for the purpose of authorising the authority to increase by £5,000,000 the aggregate amount of monies which they may borrow, and also to secure the amalgamation of the funds of the London and India Docks Pension Scheme and of the Port of London Authority Pension Scheme.

After the introduction of the Bill and by agreement with the Minister of Transport the form of the clause relating to the Authority's borrowing powers was revised so as to fix a limit of £43,000,000, beyond which the authority may not borrow without the further sanction of Parliament.

The Bill is proceeding as an unopposed measure.

Attention was drawn to the subject of pollution of rivers in the House of Lords on the 18th July, 1927, and two committees, an Advisory Committee and a Research Committee, have since been appointed.

The terms of reference are:—

"To consider and from time to time report on the position with regard to the pollution of rivers and on any legislative, administrative or other measures which appear to them to be desirable for reducing such pollution."

The chairman of the River Committee will give evidence on behalf of the authority at the next meeting of the Advisory Committee, to be held on the 7th June.

Negotiations proceeded between representatives of the Port Authority, the Dock and Harbour Authorities' Association and the Railway Companies with a view to settling the form for the keeping of accounts at docks and harbours belonging to railway companies, including the delimitation of the companies' dock and harbour undertakings, and an agreement was arrived at which brought to an end protracted litigation.

The railway companies have undertaken to prepare their dock accounts for the year 1928 in accordance with the statutory powers applicable to those undertakings, and to furnish the Dock and Harbour Authorities' Association with copies of the accounts at the same time that they lodge them with the Railway Rates Tribunal for the purposes of the first review.

On the application of the authority the Railway Rates Tribunal have applied the Schedule of Standard Charges of the London and North-Eastern Railway Company to the authority's railway system, the schedule operating as from the 1st January, 1928, the "Appointed Day" under the Railways Act, 1921.

By an arrangement arrived at between the authority and the various railway companies concerned with the carriage of goods to the docks of the authority no alteration will be made in the existing arrangements for dealing with such traffic for a period of six months after the "Appointed Day" pending negotiations for future working.

The appeals against quinquennial dock assessments in the Boroughs of Stepney, Bermondsey, Deptford and Woolwich have been disposed of by agreement with the respective Assessment Committees, and the total assessments have been reduced from £173,933 to £138,700.

The appeal against the assessment of the East and West India and Millwall Docks in the Metropolitan Borough of Poplar was heard at the London Quarter Sessions in February, 1928, and resulted in the gross value being reduced from

£310,580 to £130,000 and the rateable value from £114,576 to £30,000. The Court of Quarter Sessions have agreed, on the application of the Assessment Committee, to state a case for the opinion of the High Court of Justice upon the question as to whether port rates received by the authority are to be taken into consideration in arriving at the gross and rateable values of this dock system.

Mr. E. Aubrey Lloyd was co-opted by the elected members in June, 1927, to fill the vacancy caused by the death of Mr. William Walker.

Mr. Louis Hamilton Bolton and Mr. William Lee Wrightson were co-opted by the elected members in November, 1927, to fill the vacancies caused by the resignations of Sir John Bowring Wimble, K.B.E., and Mr. W. Varco Williams.

Mr. David Jones, J.P., was co-opted by the elected members in December, 1927, to fill the vacancy caused by the death of Mr. Charles Franklin Torrey.

The term of office of the chairman, vice-chairman and members of the authority expired on the 31st March, 1928.

The statutory meeting of voters was held on the 13th February, 1928, for the nomination of candidates, and 20 were proposed for the 17 vacancies to be filled by the votes of payers of rates, wharfingers and owners of river craft.

The result of the Poll was declared on the 20th March, 1928, the following candidates being elected for three years from the 1st April, 1928:—

Vessels.—Frederick Charles Allen, Esq.; John Howard Glover, Esq.; David Jones, Esq., J.P.; Charles Frederick Leach, Esq.; Edward Aubrey Lloyd, Esq.; William James McAlister, Esq.; Sir Montagu Cornish Turner; William Lee Wrightson, Esq.

Goods.—Captain Sir Ion Hamilton Benn, Bart., C.B., D.S.O., T.D.; Sir Arthur Cory Cory-Wright, Bart., J.P.; Arthur Charles Davis, Esq.; Charles Seton Sinclair Guthrie, Esq.; Cecil Wilfred Hodge, Esq.; Sir Charles Campbell McLeod, Bart.; Archibald Murray, Esq.; Owen Hugh Smith, Esq.; Rt. Hon. Thomas Wiles, P.C.

Frederic William Bellamy, Esq., was the only candidate nominated for election by wharfingers, and he was declared elected for three years from the 1st April, 1928.

The following were appointed for a period of three years from the 1st April, 1928:—

By the Admiralty—Admiral Sir Frederick Charles Learmonth, K.B.E., C.B.

By the Ministry of Transport—Harry Gosling, Esq., C.H., M.P.; James Daniel Gilbert, Esq., D.L., J.P.

By the London County Council (being members of the Council)—Jack Percy Blake, Esq.; Hubert John Greenwood, Esq., D.L., J.P.

By the London County Council (not being members of the Council)—Admiral The Hon. Sir Algernon Douglas Edward Harry Boyle, K.C.B., C.M.G., M.V.O.; William Devenay, Esq., J.P.

By the Corporation of London (being a member of the Corporation)—John Morgan Richards Francis, Esq., J.P.

By the Corporation of London (not being a member of the Corporation)—Admiral Sir William Edmund Goodenough, K.C.B., M.V.O.

By the Trinity House—Captain Thomas Golding, C.B.E.

Docks of the Great Western Railway.



Grain Elevator in Operation at Cardiff Docks.

Irish Harbour Matters.

IRISH FREE STATE PORTS AND HARBOURS.

Giving evidence before the Free State Ports and Harbours Tribunal on the 29th October last, in Dublin, Mr. John Ingram, Director of the Transport and Marine Branch of the Department of Industry and Commerce, explained that all powers and duties relating to harbours, docks and piers in the Free State were now vested in the Minister for Industry and Commerce. He mentioned that Cork Harbour was governed by seven special Acts and two Provisional Orders, and Dublin by thirteen separate Acts. Apart from the general Harbour Acts or other Acts relating to harbours, the special Acts and Orders numbered over one hundred.

Under the Harbours, Docks and Piers (Temporary Increase of Charges) Act, 1920, he said, the Minister was empowered, in the case of statutory harbour authorities, to make orders modifying the maximum statutory charges to such an extent as would enable the undertakings to be carried on without loss. As regards the variation of rates other than under the Act of 1920, the powers conferred upon the Minister by the special Acts applicable to particular harbours were exercisable in respect of most of the undertakings, but at Dublin such powers were limited to harbour tramway charges, a relatively small item of revenue; while at Cork the Minister could not revise any of the rates.

In Dundalk and in Limerick the Minister had power, if necessary, to raise the maximum rates above those prescribed by the Act, while in the case of all other harbours this could only be done by a temporary order of the Minister under the Harbours, Docks and Piers (Temporary Increase of Charges) Act, 1920, or by means of legislation promoted by the harbour authority.

A further exceptional position existed in the case of Waterford Harbour, where the Minister had power to revise all rates except those on goods, which at that port represented over 50 per cent. of the total income. At most ports the same rate was charged on imports as on exports, but at Galway and Limerick the different rates were payable on the same class of goods imported and exported, and in the case of the latter, the export rates were less than the corresponding import charges.

The case of Cork was exceptional. At that port the rates on goods were fixed by an Act of 1820 at a maximum of not more than 3d. in every 2s. of the freight. The anomalous result of that method of charge was that the maximum statutory rate on a manufactured commodity, such as flour, might be out of proportion to the rate on wheat, and it was also possible that the amount of harbour rates payable on a large cargo on such a basis would be less than that on a small cargo.

SHIPS REGISTERED IN FREE STATE.

During 1924 the number of ships registered and owned in the Irish Free State which cleared from Free State ports with cargoes, represented 6 per cent. of the total number of vessels which cleared during the year, and the average net tonnage of the Free State owned ships was 319. In 1925 the figures were 8 per cent., tonnage 401; in 1926, 9 per cent. with a tonnage of 384; in 1927, 7 per cent. with a tonnage of 246.

The corresponding figures for all clearances (i.e., ships with cargoes and in ballast) were 9 per cent. of the whole in 1924, with an average net tonnage of 220; 11 per cent. in 1925, tonnage 265; 10 per cent. in 1926, tonnage 289; 12 per cent. in 1927, tonnage 216.

The outward total (ships with cargo and in ballast) of Free State-owned and registered ships considered in terms of total net tonnage was, however, only 3.6 per cent. of the total outward trade in 1924; 4.3 per cent. in 1925; 3.4 per cent. in 1926; and 3.7 per cent. in 1927.

During 1924 the number of ships registered and owned in the Irish Free State which entered on ports with cargoes was 10 per cent., the average net tonnage of the Free State ships being 215. In 1925 the figures were 11 per cent., tonnage 259; in 1926, 10 per cent., tonnage 293; and in 1927, 13 per cent. with a tonnage of 212.

The corresponding figures for all entrances (ships with cargoes and in ballast) were 9 per cent. of the whole in 1924, with an average net tonnage of 214; 11 per cent. in 1925, average tonnage 258; 10 per cent. in 1926, tonnage 288; 12 per cent. in 1927, tonnage 215.

The inward total (ships with cargoes and in ballast) of Free State-owned and registered ships considered in terms of net tonnage was only 3.6 per cent. of the whole in 1924; 4.2 per cent. in 1925; 3.3 per cent. in 1926; and 3.6 per cent. in 1927.

FINANCES OF CORK HARBOUR BOARD.

With a view to ensuring sufficient revenues to enable them to carry on their undertakings without loss, the Cork Harbour Commissioners made application some time ago to the Department of Industry and Commerce for power to increase certain tonnage dues. The matter was the subject of an enquiry by the Rates Advisory Committee, which held a sitting in Cork on the 16th October last, Judge O'Brien, chairman, presiding.

Mr. E. P. McCarthy, President of the Society of Incorporated Accountants in Ireland, submitted a statement showing the

estimated income and expenditure of the Board in 1928-29 on the proposed new tonnage and cargo rates.

The estimated income was £100,550, which included £49,141 from goods dues, £4,746 from rents, investments, interest, etc., and £25 from Government vessels, while the expenditure was estimated at £98,216.

A £27,000 SCHEME.

It was pointed out that in consequence of their unsatisfactory financial condition the Harbour Commissioners had been obliged to abandon or defer necessary port improvements. In the early part of this year, however, it became apparent that the provision of extra berthage accommodation for overseas vessels of deep draught could not be put off any longer. Consequently the Harbour Commissioners decided to reconstruct Victoria Quay Wharf in ferro-concrete for its entire length of 1,200-ft., with piles driven, with dredging to allow 30-ft. of water at low water spring tides. For this work the engineers estimate was £27,000.

New transit sheds, the improvement of the harbour entrance and the development of the Tivoli scheme, said Mr. McCarthy, were some of the works calling for attention, and increased expenditure would be necessary under these heads. Although the application was for an order for power to charge the goods dues specified in the existing schedule of goods dues, where the dues leviable under the 12½ per cent. clause were less than the full schedule rates, as well as for power to charge increased tonnage dues, it was not the intention of the Board to charge the full schedule rates in all cases.

The application as regarded dues was really made to enable the Board to readjust the incidence of their dues, so that they might give certain trades the relief which they sought. It was further pointed out that, owing to the operation of the 12½ per cent. freight clauses, the Board was not able to collect the full schedule rates on certain imports, such as flour, the schedule rate of which was 2s. 5d. per ton (while they were actually only getting 1s. per ton), while other imports such as wheat, and exports such as live stock, eggs and agricultural produce in general had to bear the full schedule rates.

TRADE AT DUBLIN INCREASING.

At a recent meeting of the Dublin Port and Docks Board, Mr. E. H. Bailey, Secretary, reported that for the first nine months of this year there was an increase in foreign trade of £2,000 and a decrease on cross channel trade on which dues were paid of £300, compared with the corresponding period last year, an increase of £1,700 in all.

NEW MEDICAL OFFICER FOR DUBLIN.

Dr. Mortimer Walters, Mervion Road, Dublin, has been elected medical officer to the Dublin Port and Docks Board by 13 votes to 7. There were 24 candidates.

LAUNCH FROM WORKMAN CLARK'S.

The first launch under the new management of Messrs. Workman, Clark Ltd., Belfast, took place last month when a twin-screw sludge steamer, built to the order of the Belfast Corporation, was launched from the firm's North Yard. The principal dimensions are 152-ft. by 29-ft. and 12-ft. to the main deck. The vessel is built of steel throughout and the machinery consists of two sets of inverted direct acting triple expansion engines. During construction the vessel was under the supervision of Messrs. J. H. McIlwaine, Naval Architects, Belfast; also the Belfast City Surveyor's Department.

WORK FOR BELFAST SHIPYARDS.

Messrs. Workman-Clark (1928), Ltd., Belfast, have received an order for the construction of 6 vessels for the Bank Line, of which Messrs. Andrew Weir and Co., London and Glasgow are the owners. This order will probably mean the re-opening of Messrs. Workman, Clark's South Yard. Four of the new vessels will be steam driven and two are to be motor driven. The type of machinery used will be the Sulzer. They are intended for the cargo services of the Bank Line, mainly in the East and in the Pacific.

In addition to this contract the firm has under construction three vessels: a 20,000-ton oil tanker, a Holt Line motor ship and an Ellerman liner.

Messrs. Harland and Wolff, in their Belfast Yard, have 200,000 tons of shipping under construction so that the outlook for shipbuilding in Belfast is good.

FOURTEEN MILLION TINS OF SALMON.

Another illustration of the rapid manner in which imports are discharged at the Port of Liverpool has come to hand; this time the instance being provided by a cargo of tinned salmon. The s.s. Nellore, from Kamchatka, commenced discharging at the Queen's Dock No. 2 at 2.30 p.m. on the 2nd November, and by 5 p.m. on the 6th had discharged 14,600,352 tins of salmon in 182,747 cases.

The Port of Liverpool has long been famous for its rapid discharge and the above affords a good illustration, the average rate of discharge of the s.s. Nellore being 125 tons per hour, an excellent performance for cased goods.

The Port of New Orleans.

OPENING OF THE POYDRAS STREET GREEN COFFEE TERMINAL.

The first bags of coffee to pass over the Poydras Street Green Coffee Terminal of the New Orleans Dock Board were discharged from the ss. "Salvation Lass" of the Mississippi Shipping Company on October 3rd, 1928. Discharging began at 1 p.m., and the event attracted a large attendance of coffee importers, steamship officials, railroad representatives and other



The first sling-load of Coffee into the Poydras Street Green Coffee Terminal, New Orleans. Ex S.S. "Salvation Lass," October 3rd, 1928.

interested persons. All of the port commissioners were present, as well as principal officials. There were no ceremonies, but enthusiastic cheers arose as the hatches were opened and sling-loads of coffee were hoisted over the side of the vessel on to the tractor-trailer equipment which moved it promptly into the assigned portions of the shed. Many present had never seen the unloading of a coffee cargo and were astounded, as all were pleased, with the expeditious handling from ship into transit storage.

This great terminal has been erected by the Board at a cost of approximately \$2,000,000. It is a two-storey structure of reinforced concrete and steel, built for the purpose of handling over 3,000,000 bags of coffee per annum through the Port of New Orleans. This branch of the import trade has grown rapidly in recent years, until New Orleans is now a close second to New York as a coffee import harbour, and far ahead of any other port in respect to this commodity. The storage capacity of the shed under transit working conditions, which involve ample space for inspection, segregation, and handling, is upwards of 300,000 bags. The main wharf is 840-ft. long, extending upstream from Canal Street, and is 300-ft. wide, with a two-storey shed 250-ft. wide extending its full length. Adjoining this is the Girod Street section, provided with a single-storey shed 530-ft. long. The full wharf length, therefore, is 1,370-ft. with a 20-ft. wharf apron and a 30-ft. concrete rear roadway for its full extent. The Girod section has rail tracks on the wharf apron and the entire facility is served by tracks of the Public Belt Railroad.

News of the arrival of this first cargo at the new wharf quickly spread among the green coffee trade, and congratulatory telegrams were received by the Dock Board from large shippers of Kansas City, St. Louis, Chicago, and other points of the middle west which receive their coffee requirements principally through New Orleans. Several other vessels from Brazil are en route, so that the new facility will soon be operating at full capacity, a condition which is expected to obtain permanently. The largest cargoes of coffee are in excess of 100,000 bags, and the Poydras Street shed will be able to care for such a cargo on one floor.

INSURANCE AND COMPENSATION FUNDS OF THE NEW ORLEANS DOCK BOARD.

The thirty-second annual report of the Board of Commissioners of the Port of New Orleans will have the following to say regarding the fire insurance and workmen's compensation funds accumulated by the Board:—

"The Board has accumulated a fire insurance fund in cash and securities of \$1,176,369.98 and also carries commercial insurance to the amount of \$20,000 on its wharves. The premium on this amount of insurance is paid by the interest which accrues on bonds owned by our insurance fund. As a result, the amount of money set aside year by year, by the Board for insurance, is placed in our own insurance fund. It appears we are protected by a figure substantially larger than the probable loss from any one fire.

"The Board's Workmen's Compensation Fund is worth \$908,589.11. These two funds are worth a total of \$2,084,959.09, of which amount \$1,448,312.00 is invested in interest bearing bonds, of the United States Government, the State of Louisiana, and political sub-division of the State of Louisiana, which yield a handsome yearly income. The par value of the above bonds is \$1,432,000.00."

RECORD FOR CANAL LOCKS.

The s.s. "Edward Luckenbach," Captain Murphy, 425-ft. long by 57-ft. beam, a vessel of 12,614 deadweight tons cargo capacity, on Thursday, October 11th, passed through the locks of the New Orleans Industrial Canal, drawing 32-ft. 3-in. of water, and proceeded to her regular discharging berth at Galvez Street, with approximately 10,000 tons of canned goods, beans, dried fruit and similar merchandise in her holds, from Seattle, Tacoma, Portland, San Francisco and Los Angeles. The owners have 927-ft. of shedded wharf under preferential assignment from the Dock Board at this point. Vessels have frequently passed through drawing around 31-ft., but this is the deepest draft that has yet been accommodated at this dock. This vessel had 11-in. of water under her keel when passing over the sill. She was locked through to her berth in less than 30 minutes, some extra precaution having naturally been observed in passing through a vessel of this extreme draft. It is estimated that her displacement as loaded was between 18,000 and 20,000 tons.

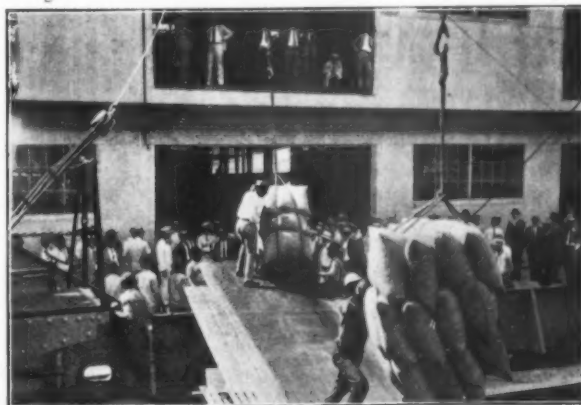
The s.s. "Edward Luckenbach" is one of the fastest vessels in the Gulf fleet, and has made the passage from Los Angeles to New Orleans in 13½ days. The Luckenbach Line operate five ships in this trade and have maintained their own office at New Orleans for several years under Mr. R. A. Stiegler, as New Orleans District Manager.

The Industrial Canal is an artificial waterway of 30-ft. minimum depth, which connects the deep harbour of the Mississippi River with the waters of Lake Pontchartrain. Its banks are used for private industrial purposes and for public commercial wharves.

LEGISLATION PROVIDES FOR INDUSTRIAL DISTRICTS ON NEW ORLEANS INNER HARBOUR CANAL.

Development of industrial districts from lands contiguous to New Orleans inner harbour navigation canal will be undertaken by the Board of Commissioners of the Port of New Orleans as result of an amendment to the state constitution which was adopted by the voters of the State of Louisiana on November 6th, and which confers on the port commission broad powers for undertaking the improvement of industrial sites. The canal has been used almost exclusively for navigation purposes for the five years since it was opened, and approximately 1,000 vessels of all classes now are using it each month. Industrial development has taken place, however, only on the limited areas which were owned by the Board. The Board now has authority to co-operate with private owners for improving industrial sites and giving them access to the canal by means of laterals.

Under the new law the port commission is authorised to create and organise industrial districts in connection with the canal, and to that end it may (1) acquire land, or control thereof, by purchase, lease, contract or expropriation, (2) exempt the lands and improvements of the industries in such districts from state, municipal and parochial taxation for not



Ship's Tackle on the S.S. "Salvation Lass" delivering Coffee to wharf as fast as it can be removed by tractor-trailer equipment into Transit Storage Piles.

more than ten years, (3) levy and collect benefit assessments against lands benefited by those improvements, but only by contract with the owners thereof, (4) issue bonds secured by that benefit assessment and by the land itself, and (5) enter into all contracts incidental to the purposes.

Under the plan the Port Commissioners will select an area of 100 or more acres, build laterals to it from the canal, raise the land, drain it, arrange for installation of sewerage and

water mains and power transmission lines, for connection with the public belt railroad, and for the building of hard-surfaced roadways. This will be done under contract with the owners, under terms mutually agreeable, and developments of this character will be continued as contracts are made for improvement of additional tracts.

The canal is a deep-water artery, 5½ miles long, connecting the Mississippi River and Lake Pontchartrain. It is 30-ft. deep with a bottom width of 150-ft., and within the corporate limits of the City of New Orleans. While certain portions have been reserved for commercial harbour developments, the areas available for industrial locations are almost unlimited. The situation is particularly advantageous because the canal waterfront is available to deep-sea vessels, to lake navigation, to vessels using the intra-coastal canal, to river craft operating between New Orleans and points inland on the Mississippi River system, and by means of the public belt railroad to ten trunk line railroads which radiate from the city.

INCREASE OF SHIPPING AT NEW ORLEANS.

Shipping at New Orleans—deep-sea, river and canal traffic—all showed an appreciable increase for the month of October, 1928, as compared with the record for the same month of 1927, according to figures of the port commission.

Of ocean steamships there were 244 arrivals, an average of almost nine for each working day, and ten more than for October, 1927. Departures were 256, or twelve more than in the previous October. Gross tonnage of the 244 arrivals was 996,915, which is an increase of 98,899, or more than 10 per cent., over the tonnage for October, 1927. (The commission does not record tonnage of departing vessels). Tonnage of goods handled over the public wharves was 357,209, this having no reference to movements over private and industrial landings.

The public banana conveyors handled 1,669,862 bunches of bananas.

The public bulk commodity handling plant received 30,028 tons of import aluminium ore and 5,790 tons of coal.

The public grain elevator received 2,882,194 bushels of corn, wheat, barley and rye, and made deliveries of 2,876,405 bushels. Receipts by rail were 1,023,594 bushels in 647 cars; by Mississippi river barges, 1,858,600 bushels in 34 barges. Twenty-four ocean steamships loaded 2,773,390 bushels in bulk; 96,709 bushels were exported from the public sacking plant. On hand in the elevator at the end of the month were 1,482,060 bushels.

The arrivals of ocean vessels by flag and tonnage for October, 1928, were as follows:—

Flag.	Vessels.	Gross Tons.
American	122	559,463
British	27	126,865
Brazilian	2	9,298
Dutch	3	21,348
Danish	7	23,735
French	6	38,257
German	1	3,667
Greek	1	3,900
Hungarian	1	4,200
Honduran	32	88,698
Italian	5	29,965
Japanese	1	9,445
Nicaraguan	3	3,889
Norwegian	25	56,653
Panaman	3	2,004
Swedish	5	15,528
Totals	244	996,915

TRAFFIC IN THE INNER HARBOUR NAVIGATION CANAL.

Using the New Orleans Inner Harbour Navigation Canal in October, 1928, were 903 vessels of all classes, with an aggregate tonnage measurement of 395,542, an increase of 132 vessels and of 39,574 tons over the record for October of 1927.

This movement consisted of 50 Mississippi-Warrior barges of 21,612 tons north-bound, and 42 of 17,523 tons south-bound; 31 ocean steamships of 139,446 tons north-bound, and 28 of 118,015 tons south-bound; 398 other vessels of 38,375 tons north-bound and 444 of 60,571 tons south-bound. This canal connects the Mississippi River with Lake Pontchartrain and with various industrial and commercial wharves, and is operated by the Board of Commissioners of the Port of New Orleans.

RIVER CRAFT AT NEW ORLEANS IN OCTOBER.

The arrivals of river craft of over 25 tons at New Orleans in October, 1928, amounted to 268 vessels of 106,865 tons, an increase of only one vessel, but of 13,131 measurement tons over arrivals for October, 1927.

These arrivals were divided as follows: 22 Mississippi-Warrior tugs of 19,223 tons; 83 Mississippi-Warrior barges of 52,791 tons (an increase of 15 barges and of 14,811 tons); 69 other barges of 21,011 tons; and 94 steamboats and other power vessels of 13,840 tons.

DEPARTMENTAL OFFICE BUILDING COMPLETED.

The ornamental office and storehouse building erected by the New Orleans Dock Board to centralise its river front departments and to form a part of the beautification project at the foot of Canal Street has been completed, and the several departments for which it was specially designed have occupied their quarters.

The building, two storeys high, is of steel and concrete construction and houses the engineer department, purchasing agent, storekeeper, superintendent of docks and harbour patrol office, and employment assistant, with their staffs, serving as well as tool house and deposit for dock board stores. It is to be known as No. 2, Canal Street.

The offices now centralised under one roof formerly were located at various points on the water front or about the city. The general office remains as heretofore on the second floor of the New Orleans Court Building.

EXPERIMENTAL SHIPMENT OF FROZEN MEAT.

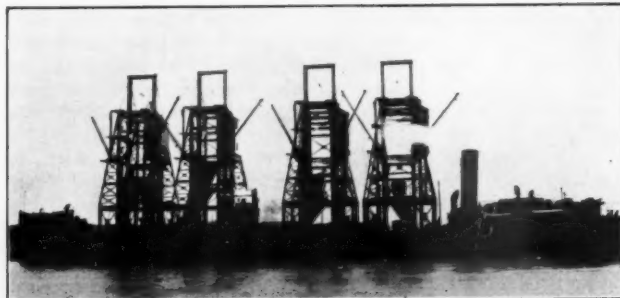
The probability that New Orleans may become an import market for frozen meats is indicated in an experimental shipment of 18 tons of beef from Buenos Aires in the O.S.K. motor ship "Montevideo Maru," scheduled to arrive at New Orleans November 12th. The O.S.K. vessels regularly use their refrigerated compartments for the movement of fresh shrimp to Japan from Gulf of Mexico ports, and for frozen meats from Argentina via New Orleans to Cristobal, but imports to the United States have not been made heretofore.

GULF-PACIFIC LINE OPENS OWN OFFICES AT NEW ORLEANS.

Announcement is made that the Gulf-Pacific Line is opening its own offices at New Orleans, with N. M. Leach, vice-president, in charge of the company's business at all ports of the Gulf of Mexico. W. A. Foerster has been appointed traffic manager for the Gulf District; R. N. Miller, marine superintendent; J. C. Spencer, district auditor, and Neal M. Leach, Junr., travelling freight agent. Sub-agents of the line are the Steele Steamship Line at New Orleans, Galveston, Texas City and Houston; Boyd-Campbell Company at Corpus Christi, Lykes Bros., at the Sabine District ports and Tampa, and Van Heynigen Brokerage Company, at Mobile.

The Gulf-Pacific Line has nine ships in the Gulf-Intercoastal trade with the ports of San Diego, Los Angeles, San Francisco, Oakland, Portland, Longview, Seattle, Tacoma and Vancouver. It was the pioneer line in the Gulf-Intercoastal trade, having commenced operations in 1919.

Docks of the Great Western Railway.

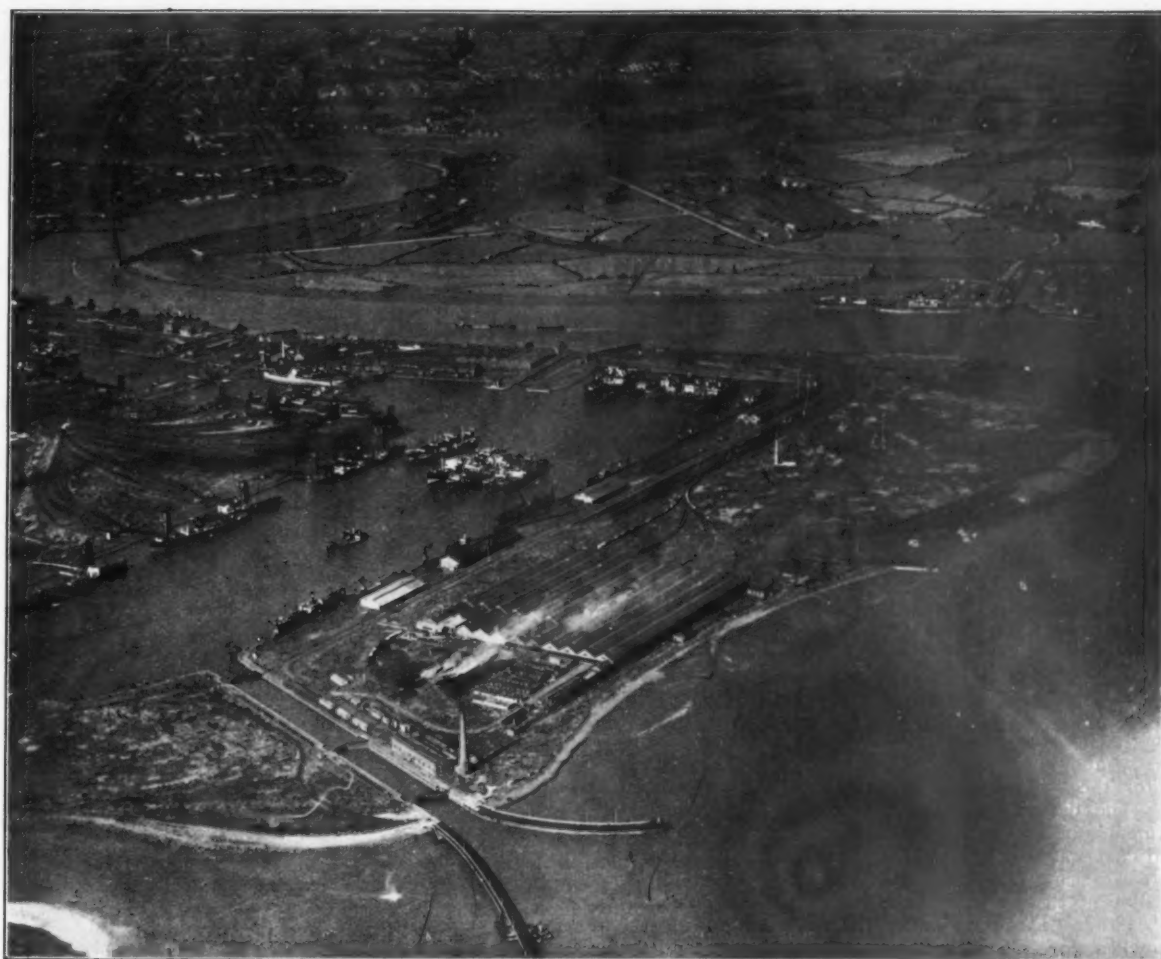


Four-basin Tip Berth at Penarth.



Discharging Esparto Grass at Penarth Docks.

Docks of the Great Western Railway.



Aerial View of Alexandra Docks, Newport.



Aerial View of Barry Docks.

Port of Southampton Topics.

The Cunard liner *Mauretania* was laid up for purposes of overhaul earlier than was intended in view of the extensive work which has had to be carried out in her engine room. The liner will remain at Southampton in the hands of John I. Thornycroft and Co., Ltd., until January 2nd, when she will start a trip to the States. Upon her return she will again pass into the hands of the ship repairers for the completion of her overhaul, and then on February 6th, she will sail for New York and her winter cruise. As a result of the overhaul of this vessel coinciding with that of others of the "Big Six," the Amalgamated Engineering Union deemed it necessary to bring labour from other parts of the country to deal with the situation. It has nearly always in the past been possible to find the extra men required in the shipyards during the overhaul season in the district, and Portsmouth has always provided any necessary men when work has been so plentiful that local labour has been insufficient. This year, however, branches of the Union in all parts of the country have been communicated with to ascertain what men are available for the work at Southampton. The fact that such measures have been found necessary is a welcome commentary on the amount of work at present in hand at Southampton.

TUG FOR RECIFE.

The twin-screw sea-going tug "*Estacio Coimbra*" has left Southampton for Pernambuco, where she is destined for use in the port works of Recife. The tug was built by Messrs. John I. Thornycroft and Sons. Her principal dimensions are: length between perpendiculars, 33.53 metres; breadth, 8.99 metres; and depth, 4.11 metres. Her designed speed is 12 knots. The vessel has a flush deck, raking stem and rounded stern, and is divided into six watertight compartments by five watertight bulkheads. The upper deck is of steel, sheathed with wood over accommodation. The tug is provided with two masts, about 45-ft. and 38-ft. high, with all necessary fittings for the use of wireless navigating lamps and flag signals. The deck-house on the bridge is divided into two compartments, one of which contains the steering wheel, compass and chart-table, while the other is arranged as a wireless office. The officers' accommodation is on the lower deck, as also is that of the crew. Steam and hand-steering gear is installed in a deck-house under the navigating bridge, and steering wheels are placed in the navigating bridge and flying bridge. The vessel is also equipped with a steam and hand windlass and a steam warping capstan. The machinery consists of two sets of compound surface condensing engines developing an aggregate horse-power of 1,200 at about 110 revolutions per minute. Suction pipes for salvage purposes are led from the two salvage pumps on to the deck. Five pumps are fitted in the engine room to deliver 6,750 litres per minute against a head of 200-ft.

NEW DEPUTY-CHAIRMAN.

Alderman S. G. Kimber, J.P., chairman of the Works and Harbour Committee of the Southampton Harbour Board, has been elected deputy-chairman of the Board in succession to Colonel Frank Willan, D.L., J.P., whose resignation was

referred to in these notes last month. Mr. Kimber is one of the leading public men of the town, and his business acumen and foresight has given him a position in town affairs which is second only to the Mayor's. Unlike the Mayor's, however, Alderman Kimber's authority goes on from year to year, and he has earned for himself the title, in some circles, of the town's "General Manager." He has an excellent record of service with the Harbour Board, on which body he has proved as active and useful as in his other spheres of public life. This elevation to the deputy-chair is a recognition of the work he has accomplished for the Board, into which he has put whole-hearted enthusiasm and all his natural ability for administration.

MONTH OF MANY VESSELS.

If all goes well, the Holland-America Line will have their newest and largest vessels operating on the Southampton service in April next. The "*Statendam*" is expected to make her first maiden voyage from Southampton in April. She will be Holland's biggest ship, her tonnage being just over 30,000, and it is claimed that her passenger accommodation will be unsurpassed. Incidentally, April will be a particularly heavy month in the docks, for, in addition to the "*Statendam*," it will see the first appearance in the port of Germany's big pair, the "*Bremen*" and the "*Europa*." These three new vessels represent something like 120,000 tons, and, at the same time, the express liners of the White Star and Cunard Lines will be in commission again. It would surprise few if April should prove a record-breaking month as far as tonnage is concerned. During the month it has been arranged that 14 vessels of 30,000 tons and over will sail from the port, and all of them—with the exception of the "*Statendam*"—will make Southampton their principal British port on the homeward journey.

NEW LINK WITH ANTIPODES.

The "*Rangataki*," the first of the three motor vessels ordered by the New Zealand Shipping Company from John Brown and Co., of Clydebank, will leave Southampton on her maiden voyage on February 15th, the other two sailing in September and October. The gross tonnage of the vessel will be 17,500, and it will have accommodation for 100 first class, 80 second and 400 or so third class passengers. She will be capable of carrying 13,000 tons of cargo, with a maximum draught of 32-ft. Each of the three vessels will have two funnels and two masts, and the principal machinery will consist of twin sets of five-cylinder Brown-Sulzer internal combustion engines of 5,000 s.h.p. capable of giving to the vessel a speed of 14 and 15 knots.

COPENHAGEN HARBOUR FINANCES.

The budget for the coming year is estimated to reach a total sum of Kr. 5,233,000, an increase of Kr. 288,000 over the previous year. Expenses for 1929 including writing off and reserve are calculated to reach Kr. 3,520,000 against Kr. 3,572,000 in 1928, a decrease of Kr. 52,000. In 1928 the estimated surplus to be placed to the reserve fund was Kr. 1,373,000. The year 1929 is expected to realise a surplus for the reserve fund of Kr. 1,713,000.

The two largest items on the income side are dues on goods Kr. 2,480,000 and dues on vessels Kr. 1,100,000, increases over 1928 of Kr. 180,000 and Kr. 81,000 respectively.

The chief items of expenditure are interest on money and pension fund Kr. 1,243,000 and wages Kr. 300,000. A sum of Kr. 300,000 is earmarked for maintenance works.

FACILITIES AND CHARGES IN ESTHONIAN PORTS.

The Department of Overseas Trade has received from His Majesty's Consul at Tallinn reports on facilities and charges incurred by vessels, including pro-forma accounts for vessels discharging and/or loading at Tallinn, Pernau and Hungerburg. In the case of Tallinn and Pernau details are also given of charges incurred on cargo landed.

A memorandum based on these reports has been forwarded to steamship owners and brokers on the Department's Special Register, and copies may be obtained by companies of British origin, capital and control upon application to the City Office of the Department (Shipping and Transport Section), 73, Basinghall Street, London, E.C.2.

THE JUNIOR INSTITUTION OF ENGINEERS.

At the 47th Annual General Meeting of the Institution, held on Friday, the 9th November, Mr. S. H. Hole, A.M.I.A.E., was elected Chairman of the Institution. Mr. S. Dunlop and Mr. E. D. Gill, Vice-Chairmen; Mr. R. H. Allen, B.Sc. (Eng.), Mr. F. C. Moore, Mr. G. A. Ogden, and Mr. E. T. Agutter, Councillors; and Mr. W. M. Hurrell, Treasurer of the Institution.

The Inaugural Meeting of the 47th Session will be held at the Royal Society of Arts, on Friday, 7th December, when the medals and awards will be distributed by the retiring President, Sir Murdock MacDonald, K.C.M.G., C.E., M.Inst.C.E., M.P., who will also induct as his successor Lieut.-Colonel J. T. C. Moore-Brabazon, M.C., M.P., and the latter will deliver his address entitled "The Future of Coal in Relation to Industry."

Docks of the Great Western Railway.



General Cargo Conveyor in Operation at Cardiff Docks

Pneumatic Grain Handling at Ports.

IN writing these notes on Pneumatic Grain Handling, the author recalls that 20 years ago the subject was very little understood, but it was felt at that time that the raising of grain from ships by pneumatic power held great possibilities. This optimism has been more than justified and the present-day pneumatic plants for handling grain are very much more efficient and scientifically correct in their design than the early plants constructed, which themselves, however, constituted a great advance on the then existing methods of handling grain, but which were not by any means strictly efficient.

The present article is intended therefore to briefly review the progress of the art of pneumatic grain handling from its infancy, and to so describe the general principles involved, with the addition of a few notes on the various mechanical contrivances and details necessary which go to make up a modern up-to-date plant, in the hope that the information may be at once interesting and useful to those interested in grain handling, whether from a technical standpoint, or that of commercial management.

HISTORICAL.

Attempts to raise grain by means of air currents were made as far back as 1865 with the idea, apparently, that it would be possible to draw grain through a pipe in the same manner as water.

All attempts on these lines naturally were unsuccessful, except for very short lifts of 4 or 5-ft., until someone conceived the idea of placing an air sleeve around the lower end of the suction pipe, which caused a mixture of air and grain to pass through the pipe instead of a solid core.

It is this system which has been developed and is in use to-day.

Another line of research was made by experiments in exhausting air from a chamber by means of an air pump and then allowing the chamber to become full of grain, when the pump was stopped and the grain run out, or a second canister put into use by means of a connecting valve.

This system was practicable within limits, but the power required was considerable and, owing to its intermittent action, the rate of transportation was low.

Mr. A. H. Mitchell, of the London Grain Elevator Co., Ltd., which was in existence in 1894, at that time was engaged in experiments with a plant which was designed to blow the grain by means of air currents at high pressure.

Air at a pressure of 100 lbs. per square inch was admitted to an injector which was placed in the grain, the delivery from the injector being carried into a warehouse where the grain was deposited on the floor. This apparatus consisted of one 5-in. diameter pipe through which the grain was elevated for a height of about 16-ft. It took 90 h.p. to lift 20 tons of grain an hour through this distance, and owing to the enormous quantity of dust created by the machine in the delivery room, it was quite impossible for anyone to remain on the floor while the operations continued.

Experiments on these lines were not pursued with any success and were soon discontinued; for two inventions had been perfected which seemed to open the way to more successful operations in transportation of grain by suction.

About 1892, Mr. F. E. Duckham, late Chairman and Engineer of the Millwall Dock Co., invented the air sleeve previously referred to, and also the air-locking device for extracting the grain.

These two inventions revolutionised ideas on pneumatic grain handling and furnished the basis upon which the whole art has since been built, very little research or experiment appearing to have been done in any other direction.

This leads us to a consideration of the modern pneumatic grain elevator as to-day constructed, and to the scientific principles involved therein.

GENERAL PRINCIPLES OF PNEUMATIC ELEVATORS.

There are eight essential parts comprising a modern pneumatic grain elevator:—

1. The Power plant.
2. The Air Exhauster or Pump.
3. The Dust Filter or "Cyclone," which retains the dust and prevents it passing into the exhauster or pump with the air.
4. The Pipes conveying the grain and air.
5. The Nozzle which dips into the grain.
6. The Receiving Chamber or "Canister" wherein the grain is first deposited.
7. The Air-Lock whereby the grain is delivered from the Receiving Chamber without loss of vacuum therein.
8. The Weigh-house and Weighing Apparatus.

In the case of a floating elevator, there is the hull or pontoon. The action upon which a modern pneumatic plant works is briefly as follows:—

The nozzles at the ends of the pipes—usually the extreme lengths are composed of flexible armoured pipe of special form—are kept buried in the grain. The grain is never so densely packed that air cannot be drawn through it, so the air as it is drawn through the grain in an endeavour to destroy the vacuum permanently maintained in the circuit by the exhauster, exerts a considerable force upon it, causing the grain to follow the air with great velocity, and this acceleration is continued until the force produced by the moving air on the grain is balanced by the retarding forces due to the weight of the grain and the friction of the grains amongst themselves and against the sides of the pipes.

By means of an automatic or mechanical air-lock of the tipper or rotary wheel valve type, the grain is discharged from the canister, without loss of vacuum therein, to a further grain hopper at a suitable height above the ground or deck from where the grain is delivered into the storage compartments, silos, weighing machines or, in the case of the floating elevator, overside into craft either direct or through the weighers.

Little progress seems to have been made with pneumatic plants in this country between 1892 and 1906, probably due to a great extent to the master patents held for the essential air sleeve or nozzle. The years immediately following, however, saw considerable advance in design principally in the reduction in the amount of power which had hitherto been found necessary for successful operation.

Continental engineers seem to have visited this country about this time, and while fully realising the possibilities of the system, were able to see the defects in the plants in existence in England and to profit by the experience. As a result, some very efficient machines were built on the Continent, and in 1914 there appears to have been scarcely a port of any importance there which was not equipped with pneumatic grain handling plants, to the great exclusion of bucket elevators.

All the research in pneumatic handling of grain seems to have been done by actual experiment or trial, and very little experimenting on a really scientific basis appears to have been attempted.

Recently, however, much useful work has been done, notably by Professor W. Cramp, D.Sc., whose research has proved both a stimulus and guide to makers of pneumatic grain handling plants.

Professor Cramp* by many tests with experimental plant, established the relationship between the velocity of the air, the velocity of the grain, and the value of the force acting upon the grain per unit of velocity difference, and these for various kinds of grain.

From this relationship, he was able to state that the grain accelerates very rapidly at the lower end of the pipe line, and its velocity finally approaches the limit.

$$V_a = \sqrt{W/d}$$

though never attaining this limit. Where V_a = velocity of the air, W = the weight of a grain, and d = a constant depending upon the velocity of the air and the weight of the grain.

When this limit is nearly attained, the force of the air on the grain is very little greater than the weight of the grain, hence the grain is now practically in equilibrium and maintains its velocity up the pipes with very little acceleration.

From these experiments he was able to measure exactly the mean velocity of the grain over the given length of pipe, and also the ratio of the quantity of grain to quantity of air.

By a series of deductions, Professor Cramp was able to state that in a vertical elevator, the work of friction between the air and grain can never be reduced to zero, and it is this fact which limits the theoretical maximum efficiency of pneumatic elevators.

This theoretical efficiency he found could never be expected to exceed 30 per cent., but this figure constituted a vast improvement upon the plants then in existence, none of which appeared to exceed 5 per cent. to 10 per cent. efficiency.

Some interesting experiments were also made with various types of nozzles and Professor Cramp's final conclusions were as follows:—

- (1) That long pipes are more efficient than short ones, though not in proportion to the length.
- (2) That a plant will work more efficiently with light and bulky material than with heavy and compact material.
- (3) That the increase in efficiency obtained by the kinetic energy of the grain is small.
- (4) That the proper method for the design of a pneumatic elevator is by means of the equations connecting the various relationships as described above.

*Pneumatic Elevators in Theory and Practice, by Professor W. Cramp, D.Sc. Journal of Royal Society of Arts, 25/3/21.

Pneumatic Grain Handling at Ports.



Fig. 1. Floating Pneumatic Grain Elevator "Alpha," Bristol Docks Committee.

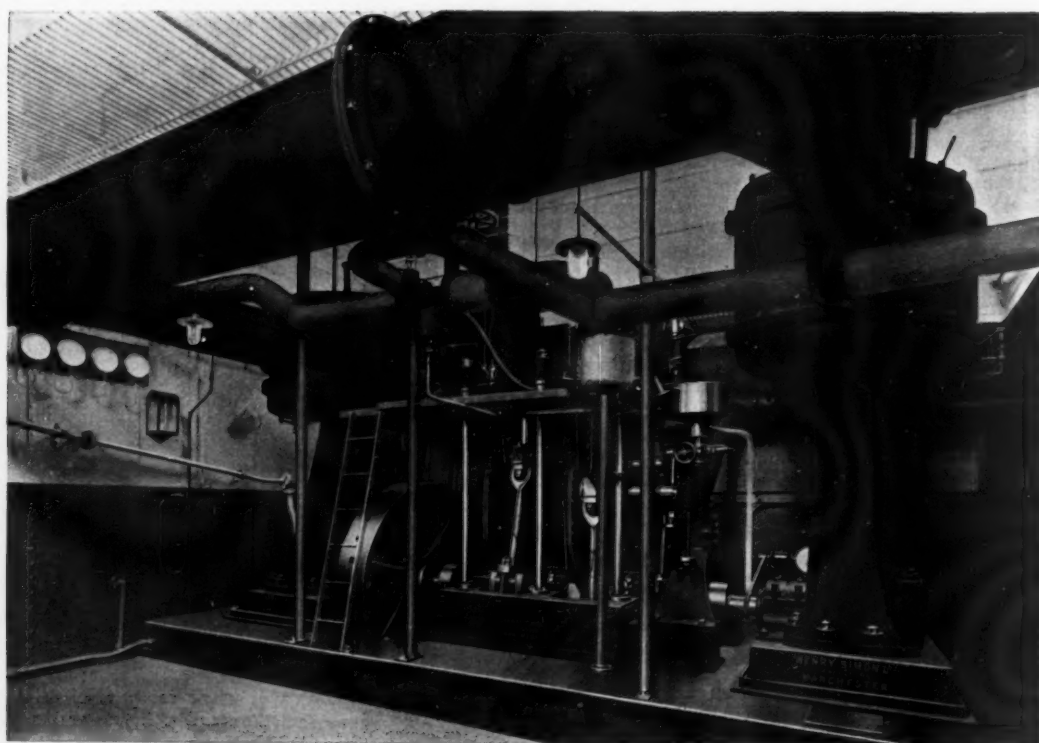


Fig. 2. Engines and Air Pumps, War Office Floating Pneumatic Elevators.

- (5) That when this method is adopted, an auxiliary air inlet is only necessary in the pipe line to keep the vacuum within certain limits to avoid undue leakage and air pump friction.
- (6) That pneumatic elevators may be built of smaller dimensions than heretofore.
- (7) That their efficiency may be increased from 5 per cent. —10 per cent. to 20 per cent.
- (8) That the grain to be expected from toper pipes is relatively small.

SPECIAL PORTIONS OF PNEUMATIC ELEVATORS DISCUSSED.

The Power Plant.—The early floating pneumatic elevators were usually driven by steam plants, but this type of plant for intermittent work has certain disadvantages and entails standing charges on account of the maintenance of, and attendance on, the boiler, i.e., night firemen, the cost of coal and loading and handling this class of fuel.

At the same time, many plants are now equipped with steam power units, although at one time there seemed to be a decided tendency to adopt oil-driven power plants.

The practice of providing Diesel or Semi-Diesel type oil engines as the main power unit has much to recommend it, both for floating elevators and shore plants, and some oil-driven power units will be described in due course.

Electrical motors as the main power unit are not particularly applicable to floating plants, but are readily adaptable to shore plants where electricity is available.

The efficiency of many steam driven plants would appear to be very low, the brake horse power per ton of grain raised under test being of the order of from 3 to 5.

On the other hand, a steam-driven floating plant has been constructed in which the b.h.p. per ton of grain raised, it is stated, did not exceed one.*

One such floating pneumatic plant known as the "Alpha" was supplied to the Bristol Docks Committee by Messrs. Henry Simon, Ltd., of Manchester, to whom I am indebted for the following brief description.

The elevator illustrated in Fig. No. 1 is employed in the Avonmouth Docks for discharging grain ships at a rate of 200 tons per hour.

The plant is arranged to deliver the grain either with its whole capacity to lighters by spouts, or by means of a telescopic conveyor across the deck of the ship to band conveyors running in subways below the quay, or, alternatively, part capacity to each.

The prime mover is a compound engine of the vertical marine type, which is coupled to vacuum pumps of standard design.

Grain is released from the pneumatic plant by a large patent tipper seal, and after being weighed, it is deposited into a hopper provided with an arrangement of shoots and valves permitting the grain to flow to either or both of two electrically-driven bucket elevators. One elevator delivers the grain through two swivelling jointed shoots to lighters alongside, and the other elevator discharges through a swivelling telescopic shoot on to the band conveyor. This conveyor is telescopic, and can be extended from 40-ft. to 64-ft. between the terminal pulleys, thus permitting the conveyor to reach across the deck of the largest Canadian liners arriving at Avonmouth. In order to facilitate the moving of the conveyor into position across the ship, it can be slewed through rather more than 90 degrees, and can be luffed up to an angle of 60 degrees from the horizontal by means of an electric winch.

This telescopic conveyor is an important feature of this installation, as it enables the grain to be discharged ashore without bringing the pneumatic plant between the ship and the quayside, so that a vessel carrying general cargo in addition to grain can unload its freight at the same time as the "Alpha" is at work.

Although the guaranteed capacity of the plant is 180 tons per hour, the capacity actually reached 216 tons for two consecutive hours during trial tests. The power absorbed by the vacuum pumps was 180-195 h.p., and it will therefore be seen that it requires less than 1 b.h.p. to operate the plant.

In the case of most early pneumatic floating plants, the steam plant was usually of the horizontal, surface-condensing type with high and low pressure cylinders, but where steam is now employed, the engine is usually of the vertical high speed marine type, and the boilers also marine multi-tubular.

During the late War, owing to the immensity of the transport problem of the British Army in France when it was necessary to handle something like 2,400 tons of oats for army horses every day at the base ports, besides hay and other stores and the shipping problem becoming more and more acute, the necessity for turning ships round quickly became an urgent one.

It was originally intended to deal with the oats by the installation of powerful travelling elevators running on crane rails on the quays, but subsequently the use of floating plants was decided upon which could be easily moved from port to

port if any big change took place in the positions of the armies, and could also be used for commercial purposes after the war.

The plants built were all steam driven. One such plant is illustrated in Figs. Nos. 2 and 3, and a brief description of the main power units is as follows:—

The engines are compound steam engines having 12½-in. and 25-in. diameter by 19-in. stroke cylinders. B.h.p. 210. Steam pressure 160 lbs. per sq. inch. Speed 130 r.p.m. The engines are fitted with auto-governing so that in the event of the load being taken off suddenly the engine maintains constant speed. The engines are direct coupled to twin pumps of standard design. The engine is provided with its own air pump, boiler feed pump and bilge pump worked off a beam on the L.P. cross head. The condenser vacuum maintained is 26-in. to 28-in. The condenser has 400 sq. ft. cooling surface. The circulating pump is operated by a small high-speed steam engine and the pump is of the centrifugal type. The boilers are 12-ft. diameter by 10-ft. long with two corrugated furnaces. The capacity of the machines is 150 tons of wheat per hour under good conditions.

Turning now to oil-driven floating plants, the Port of London Authority in 1916 decided to build two such elevators. These plants were known as "Turbo I." and "Turbo II." One of these plants appears in Fig. No. 4.

The following is a brief description of the oil engine power units adopted, taken from a paper read by Mr. R. E. Knight, M.C., before the Institution of Mechanical Engineers on 16th December, 1921.

The oil engine is a 200 h.p. four-cylinder vertical semi-Diesel made by Messrs. Vickers Petters, and was of their standard V 14 type.

The normal running speed is 250 r.p.m., but an auxiliary hand-operated governor was provided to enable the driver to vary this within limits for the different classes of grain to be worked. The fuel used is Anglo-American or other approved gas-oil of specific gravity of about 0.86 and flash-point of 150 degrees Fahr.; fuel consumption is half-pint per brake horse power hour, and about 3,000 gallons is carried in two cylindrical tanks disposed inside, and one on each side of the pontoon.

Starting up is by compressed air, blow lamp, ignition tube, etc., and can be effected in less than three minutes from cold. A large flywheel was fitted to minimise cyclical variation.

Cooling is by circulation of dock water to engine-jackets; there is no water injection to the cylinders.

The engine exhausts are carried about 30-ft. above deck level and are provided with silencers, water sprays, etc., also hand holes to facilitate periodical cleaning.

These engines were coupled to a special type of Turbo air exhauster of which more will be said later, and the efficiency of the whole plant is given in a table in the above-mentioned paper as 1.72 to 1.9 brake horse power per ton.

These two oil-driven plants gave such satisfaction in regard to service and economical running that in the year 1924 the same port authority added to their fleet of floating grain plant two more oil-driven elevators known as the "Legion" and "Phalanx."

These two craft again are identical, and were supplied to specifications and general schemes prepared by the authority's engineers by The East Ferry Road Engineering Co., Millwall, but the engines were built by Messrs. Beardmore, Ltd.

The following is a brief description:—

The engines are semi-Diesel 2-cycle oil engines developing 230 brake horse power at 188 r.p.m., and capable of giving 20 per cent. overload at same speed. They are of the vertical 2-stroke single acting type, 4 cylinders 15½-in. diameter by 19-in. stroke. Starting is by compressed air with an electrical sparking device.

A hand-operated governor is provided together with a centrifugal type to control the speed by automatically altering the length of the fuel pump stroke to suit the load.

The fuel consumption is given as .5 lbs. per h.p. per hour on full load and .6 lbs. on half load.

The air exhausters are of the reciprocating vertical type on these elevators, and deliver 8,000 cubic ft. of air per minute at a vacuum of 10-in. of mercury.

The cylinders—two in number—are 40½-in. diameter by 15-in. stroke.

An auxiliary bucket elevator is provided for raising the grain to the canister, the grain then falling by gravity to the weighers.

Four nozzles of the camel-back type are used, and the total output of each elevator is 110 tons per hour.

The pontoon is 60-ft. long, 31-ft. beam and 11½-ft. deep. It should be carefully noted that the brake horse power given in the table before referred to and as given above is that of the main power unit only, and that this, in the case of the two plants considered, is not the total power used in elevating and discharging the grain.

For certain reasons, it was desirable to have the pontoons of these plants as small as possible, and the plants therefore embodied auxiliary bucket elevators to elevate the grain from the grain canister to the hopper to ensure stability for the relatively small hull of the pontoon.

*See remarks on auxiliary elevators.

Pneumatic Grain Handling at Ports.

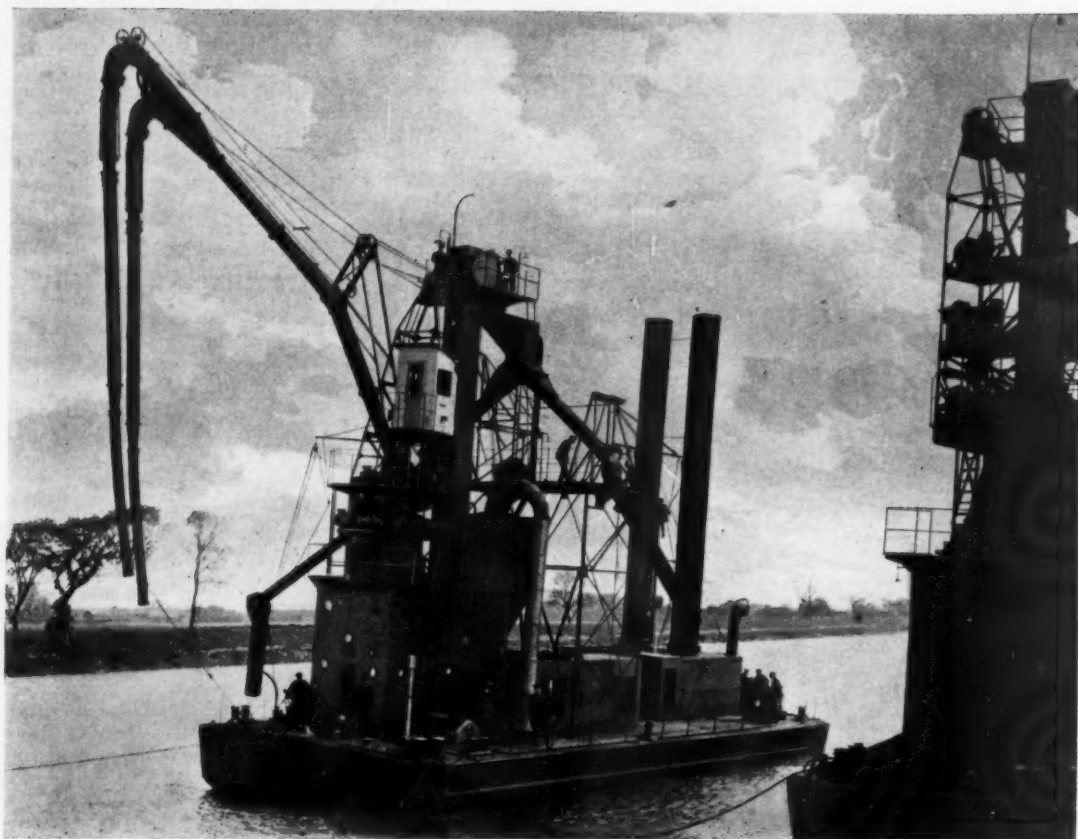


Fig. 3. War Office Floating Pneumatic Elevator for Calais.



Fig. 4. Floating Grain Elevator "Turbo I." Port of London Authority.

Care should therefore be taken when comparing the overall efficiency of plants to note whether they are of the same type either elevating the grain to its maximum height at one operation, or whether auxiliary elevators are embodied. Due allowance should be made for the extra power and costs involved in the latter type.

On modern types of oil-driven floating elevators, it is usual to instal a separate oil engine coupled to a dynamo which provides the electric power for driving the subsidiary motors for operating the tipper, slewing the pipe-handling gear, tilting the "post," luffing the pipe booms and telescoping the suction pipes, driving winches and capstans, lighting, and so on.

(To be continued).

Mersey Docks and Harbour Board.

Annual Report for the Year ending July 1st, 1928.

At a meeting of the Mersey Docks and Harbour Board, held on November 29th, 1928, Richard D. Holt, Esq., Chairman, read the report for the year ending July 1st, 1928, as follows: "The expenditure on capital account has risen by £664,838, of which £376,715 was expended on the Gladstone Docks, £133,282 on the Birkenhead entrances and £91,735 on the training banks in the sea channels.

"The works at the Gladstone Docks were not completed until October last, so that there will be a small expenditure to be charged in the current year, and similarly the work at Birkenhead, especially on the inner entrances, is not yet finished and will add to our capital charges, but even so the aggregate will be small compared to that of any of the years immediately preceding.

"Our revenue from rates and dues shows a falling off of £126,813, which is almost exactly the figure at which, when addressing you on this occasion last year, I placed the gain in gross receipts arising from the coal stoppage, namely, £124,000.

"As a result of the settlement with the local Rating Authorities of a long-standing dispute as to our assessment, we are able to show a saving of approximately £65,000 in our provision for rates and taxes.

"I desire to acknowledge the amicable manner in which the representatives of the local Authorities negotiated with us, and to express the satisfaction which everyone will feel that a long-standing difference of opinion has been settled locally, thereby avoiding the heavy expenses of a protracted lawsuit.

"This is not an annual gain but the result of the fact that, as prudent business men, our past Accounts had made provision for the worst—it is a windfall which will not be repeated unless we get something out of the new Government proposals, which in any case are not likely to affect our accounts for 1929. This is not the proper occasion for expressing an opinion as to the merits of the Government proposals, but I think there will be general agreement that any benefits given to freight transport hereditaments should be given to all simultaneously.

"The surplus on our Warehouse Account shows an improvement of £14,589, and the net result is that we place the full £100,000 to our Sinking Fund and add £23,669 to our Unappropriated Receipts Account, which sum, together with some trifling amounts from other sources, slightly exceeds the charges against that account for sundry improvements.

"The revenue from rates and dues, which is as you know the main revenue of the Board, as I have already stated, remains at the same figure as that of last year, apart from the abnormal revenue due to importations of coal.

"This is not unsatisfactory when it is realised that one single item, Raw Cotton, shows a falling off of £42,000 on imports and of £3,000 on exports, the total amount imported falling from 688,834 tons to 433,371 tons. As stocks held in Liverpool declined during the year from 1,291,730 bales to 757,910 bales, the reduction in imports does not indicate any corresponding inactivity in the manufacture of cotton, and this is confirmed by the fact that the exports of cotton manufactures through Liverpool have only fallen from 1,626,533 packages to 1,580,223 packages, with a loss of revenue of £1,114. Against this the exports of woollen manufactures have risen from 61,026 packages to 102,577 packages, with a gain in revenue of £918.

"The total tonnage of vessels entering the docks at Liverpool and Birkenhead during the year was 15,246,121 tons, and this is the greatest tonnage ever dealt with except last year when the conditions were abnormal consequent upon the coal stoppage.

FINANCE.

"During the past year Bonds to the value of £2,657,588 fell due for renewal, the average rate of interest on which was £5 2s. 2½d. per cent. Of these, £1,788,355 were renewed at an average rate of £4 19s. 11½d. per cent., and new money to the amount of £1,486,706 was borrowed at an average rate of

£4 19s. 4½d. per cent., partly to replace the Bonds which were paid off and partly to pay for the new capital expenditure. All these borrowings took place at par, and the commissions paid amounted in the aggregate to £3,553. The corresponding rate for renewals last year was £5 2s. 9½d. per cent., and for new money £5 3s. 0½d. per cent., so that the Board has been able to borrow at approximately 3s. per cent. less interest than in the previous year.

GLADSTONE DOCK.

"Turning now to the Dock Engineer's report, which is also laid before you, the Gladstone Dock was completed during the year except for the shed at the North end of the West Quay, which was not finished until October, and to this there may be a small addition when we are able to remove the Seaforth Battery, as to which negotiations are progressing.

"The system is appropriated to the full extent permissible, if anything is to be reserved for chance vessels, and work is going on most satisfactorily. There has been, as a consequence, a considerable re-arrangement of berthing throughout the Estate, and many Lines have obtained improved accommodation, and the Board is in a position to find accommodation for new enterprises.

ALFRED DOCK ENTRANCE.

"The new outer entrance to the Alfred Dock, Birkenhead, was opened by the Earl of Derby on July 21st last, to whom we are grateful for this additional example of the warm interest which for so many years he has taken in everything relating to our Port. The dredging outside is still in progress, and until it is finished the full advantage of the deeper sills cannot be obtained, but there is no doubt as to the help this work will give to the export trade in which the Port of Liverpool occupies a pre-eminent position.

BRUNSWICK DOCK ENTRANCES.

"Two steel jetties are in course of construction at the Brunswick Entrances, with the object of controlling the banks which have been a perpetual menace and a source of great expenditure on dredging. The work is admittedly experimental, but so far as can be seen there is every reason to anticipate a favourable result.

CONSERVANCY.

"The work on the Burbo Training Bank has been steadily pursued, and more rapid progress has been possible through the release of some of our hoppers from service at the Gladstone Docks making them available for the carriage of stone from the Welsh quarries.

"On the whole our sea channels show no deterioration, but we cannot rest content with things as they are, and constant thought and experiment have to be employed in seeking means to make the approaches to Liverpool correspond more nearly to our desires.

"The Conservancy Account is again satisfactory, and we felt justified in making a reduction of approximately 21 per cent. in the harbour rates last May, but the future liabilities of the Account are very uncertain, and it is quite conceivable that there may be developments which will impose heavier charges on this fund, though of course such a misfortune may be avoided.

"It is again my pleasure to thank our General Manager and the whole of the Staff for their services during the year. Their efficiency in carrying out their duties is well known to you, and they have our best thanks."

THE PORT OF LEITH.

In the September 1928 issue of "The Dock and Harbour Authority," on page 344, we presented an article on the Port of Leith with reference to the opening of the new grain warehouse which took place on the 20th of July, 1928, and in this article we omitted to state that Messrs. Spencer (Melksham), Ltd., were the contractors for the construction of the Pneumatic Grain Intake Plants and for the entire equipment of the new warehouse.

TORONTO BECOMES A GRAIN PORT.

Two new elevators are now nearing completion on the water front of Toronto Harbour, the coming into operation of which will signalise the revival of Toronto as a grain-shipping port. Not since 1901 has grain been unloaded and stored at an elevator within the limits of the City of Toronto.

The erection of the elevators follows in the path of extensive improvements brought about by activities of the Toronto Harbour Commission. One elevator being erected for Messrs. James Playfair and Co., of Midland, Ontario, and associates, has a storage capacity of 2,000,000 bushels in two units each of a million bushels. The other elevator operating in connection with the new plant of the Canada Malting Company has a grain-storage capacity of 750,000 bushels. Contracts for all these elevators were let early in June, and so quickly has the work progressed that they will be ready to hold grain before the close of navigation on the Great Lakes.

Belfast Harbour Notes.

At a meeting of the Belfast Harbour Board, Mr. R. E. Herdman, D.L., in the chair.

Letters were submitted to the Traffic and Navigation Committee from the Minister of Commerce (Northern Ireland) and the Dock and Harbour Authorities' Association, intimating that, in view of the separation of the Irish Free State from the United Kingdom, a committee had recently been constituted by agreement between His Majesty's Government and the Governments of Northern Ireland and the Irish Free State to consider what steps, if any, were desirable with a view to the creation of machinery for dealing with questions which may arise in connection with the conveyance by railway (or by arrangement with railway companies) of traffic between Great Britain and Northern Ireland and the Irish Free State in respect of which the Railway and Canal Commission previously had jurisdiction.

The General Manager reported that the Belfast Chamber of Commerce had recommended that a Railway Rates Tribunal, constituted of representatives of Great Britain, Northern Ireland and the Irish Free State, should be set up.

It was decided that a similar recommendation be made by the Harbour Board.

The Harbour Master reported that 438 vessels arrived at the port during the period from the 14th October, 1928, to the 3rd November, inclusive, as follows:—Coastwise and cross-Channel, 388; foreign, 37 steam and 1 sail; non-trading, 12 steam.

The total tonnage of the vessels arrived from 1st January to 3rd November was as follows:—Coastwise and cross-Channel, 1,939,539, an increase of 17,510 as compared with the corresponding period of last year; foreign, 545,066, a decrease of 45,658; non-trading, 53,526, a decrease of 1,669. Total 2,538,131, a total decrease of 29,817 as compared with the corresponding period of 1927.

At a lunch following the launch from Harland & Wolff's Shipyard, Belfast, of the Nelson liner Highland Brigade, Mr. F. E. Rublick, J.P., managing director of the builder's firm, proposed the toast of the Harbour Board and acknowledged the great help given from time to time by the members of the Board. They were able to talk frankly with the Commissioners, to state their views and to tell exactly what they wanted, and if it was possible for them to do it the Harbour Commissioners always met them.

Mr. Herdman, Chairman of the Board, in reply, said that both the shipbuilders and the Harbour Commissioners were necessary to each other. At all times the members of the Board were anxious to do all they could within reason for shipbuilding in Belfast.

The culvert under the Newry (sea-going) Canal collapsed and when discovered between 4-ft. and 5-ft. of water had escaped from the canal. The water in the canal gradually escaped until there were only a few inches, with the result that the whole shipping of the port was held up.

Lord Craigavon, Prime Minister of Northern Ireland, who was accompanied by Mr. J. M. Barbour, the Minister of Commerce, visited Newry in connection with the canal collapse. The visitors were met by representatives of the Harbour Board and made an inspection of the canal.

Subsequently at a meeting of the Urban Council, Mr. O'Hagan announced that, in the opinion of Lord Craigavon, the expenditure would probably run to £10,000 or over, but they were to go ahead, and the Prime Minister would not see them stuck.

The meeting considered matters in detail, and it was urged that a deep-water scheme should not be lost sight of.

Newry Urban Council met specially to consider the question of repairing the canal, decided to proceed with the scheme for the provision of a new culvert and for repairing the Albert Basin.

It was also decided to have a Bill promoted in the Northern Parliament for a canal extension scheme at an estimated cost of £60,000, made up as follows:—£35,000 from the town, £15,000 from the Government, and £10,000 from the Port and Harbour Trust Debentures.

The clerk presented a report by Mr. T. S. Gilbert, Engineer to the Belfast Harbour Commissioners, on his inspection of the canal and the proposed making of an open channel from Victoria (sea) Locks to the Albert Basin at Newry.

"Provided that the plans, sections, borings, etc., are reasonably correct—and I see no cause to doubt their general accuracy—" said Mr. Gilbert, "there does not appear to be any serious engineering difficulty in dredging an open channel, approximately four miles long from Victoria Basin to the Albert Basin, sufficient to admit of vessels up to 1,000 tons gross reaching Newry about the time of high tide. The channel would be connected with the Albert Basin by means of a suitable lock, the proper site for which would be the low-lying land on the westward side of the river, south of the basin; where there is also room for a slightly-constructed wharf and for a basin to facilitate vessels entering and leaving the lock."

Mr. Gilbert, in the course of supplementary notes to his report, said, "With regard to the number of hours before high water when vessels might be expected to reach the pro-

posed lock at Albert Basin, this would not depend so much upon the depth of the water in the proposed channel as on the depth of the water below Warrenpoint, where, according to the Admiralty chart, there is only six feet below low water mark. It is obvious that the time at which it will be safe for a vessel to enter in over the shallow water, south of Warrenpoint will be the main factor in the time of arrival at Newry."

Finally Mr. Gilbert remarked that before coming to any definite decision it might be advisable to consider as an alternative the possibility of improving the existing canal to meet the needs of larger vessels than are at present able to use it.

It was stated in the course of the discussion that followed that the cost to the rates of repairing the culvert would be 4d. in the £, and for the larger scheme an addition of 11d. on the rates.

A deputation representative of the Council, the Trust, and Lord Kilmorey and Mr. D. Ferris, J.P., was appointed to interview the Minister of Home Affairs on the matter.

BROMBOROUGH DOCK.

Messrs. Vickers-Armstrongs, Limited have received from Messrs. Lever Bros., Limited, an order for two pairs of Steel Lock Gates for their new dock at Bromborough.

TENDERS WANTED FOR SUCTION HOPPER DREDGERS—AUSTRALIA.

His Majesty's Senior Trade Commissioner in Australia (Mr. R. W. Dalton, C.M.G.) reports that the Department of Public Works, N.S.W., is calling for tenders, to be presented at the offices of the Agent-General for New South Wales in London, Australia House, Strand, W.C.2., by the 7th January, 1929, for the supply of two self-propelling steel twin screw trailing suction hopper dredgers (Contract No. 4).

Firms desirous of offering British-built dredgers can obtain further particulars of this call for tenders upon application to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. Reference number AX. 7196 should be quoted.

LAUNCH OF H.M.S. "RESOURCE."

The sixth and last launch of the year from the Naval Construction Works of Vickers-Armstrongs, Limited, Barrow-in-Furness, took place on the morning of Tuesday, November 27th, when Mrs. Headlam, the wife of Lieut.-Col. C. M. Headlam, D.S.O., O.B.E., M.P., Parliamentary and Financial Secretary of the Admiralty, launched H.M.S. "Resource."

The religious ceremony was conducted by the Lord Bishop of Carlisle, assisted by the Bishop of Barrow-in-Furness, and the Reverend J. H. Martyn Barrow.

It is interesting to note that this ship is only the second vessel in the Royal Navy bearing the name "Resource." Her predecessor was a sixth-rate ship carrying 28 guns and of 603 tons displacement. She was built on the River Thames and launched on the 10th August, 1778. After useful service, she was converted to a Troopship in 1801, and in 1803-6, after being converted as a Floating Battery, she was stationed in Lower Hope and manned by Trinity House for the defence of the Thames during the threatened invasion by Napoleon. In April, 1806, she was re-named the "Enterprise," and was stationed off the Tower of London as a Receiving Ship. She was sold in August, 1816.

The "Resource" is 500-ft. B.P. and will be propelled by two sets of Parsons Turbines driving twin screws through single reduction gearing, developing a total shaft horse power of 7,500. Steam is supplied from four water tube boilers of the three drum "Yarrow" type, at a pressure of 235 lbs. per sq. in., arranged for oil burning only under the closed stoekhold system of forced draught. The condensers are of the Contraflo latest type. The usual auxiliaries, including steam-driven main and auxiliary air pumps, circulating pumps, feed pumps, etc., of the latest design will be supplied.

The vessel will have ample accommodation for a large repair staff as well as the normal ship's complement, and careful consideration has been given to securing the comfort and efficiency of the staff and crew in extremes of climate.

The workshops are of a large and most comprehensive character, well provided with cranes, etc., for heavy lifts, and include smithy, plate shop, torpedo shop, boat shop, foundry, copper-smiths' shop, electrical shop, wood-working shop, heavy machine shop, light machine shop, grinding machine shop, etc. They are equipped with machines of the very latest type to carry out a large variety of repair work. All the machines are electrically driven, and some idea of the extent of the machinery may be gathered from the fact that the Diesel and turbine driven electric generators have a total capacity of 2,300 K.W.

Altogether, the "Resource" will be a most important addition to the strength of the British Navy, and, together with the Submarine Depot Ship "Medway," which was launched last July, will undoubtedly improve the efficiency and especially the mobility of the fighting ships, rendering them more independent of shore repairing establishments.

Lunch was provided in the General Offices after the launch, at which the Chairman of the Company, General The Hon. Sir Herbert A. Lawrence, G.C.B., presided.